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MINING AND SCIENTIFIC PRESS

	PAGE		PAGE
A		Charleton, Dickinson & Co., Professional Customs	615
Abandoned Project, Editorial	2	Chase, A. B., The Caving System at the Darlen Mine	238
Ditto, James W. Neill	144	Charging of Blast-Furnaces, E. H. Messiter	528
Abbe, Paul O., Spiral Feed for Tube-Mills	62	Chloride Solutions, Copper in, Gustave Fernekes	592
Abbott, James W., A Fundamental Problem	143	Cholx-Guadalupe y Calvo Mining Districts	656
Ditto, Ploche, Nevada	176	A. W. Warwick	656
Ditto, Professional Customs	617	Circumstances, Mining Under Adverse	E. McCormick
Absurdities of Promotion, Aubrey L. Wisker	205	Clark, Albert L., Wall Street	808
Accounts, A Card System of Mine, R. S. Handy	50	Clean-Up, Melting, and Refining of Gold Bullion	
Acetylene Lighting, N. Goodyear	460	Gerard W. Williams	277
Mine Lamp, A Portable, Edwin A. Daue	26	Coal Fields, Alaska	89
Adams, W. J., Mechanical Treatment of Gold Ore	374	Mines, Fatalities in, Editorial	792
Adgate, F. W., Sinking Through Bad Ground	183	Mining in California	186
Adverse Circumstances, Mining Under, E. McCormick	812	Cobalt, Frank C. Loring	814
Advertising, The Institute and, Editorial	348, 371	Coffee Creek Mining District, The Geology of the	
Methods of, Charles S. Palmer	457	Norman S. Stines	25
Alaska Coal Fields	89	Collins, Edgar A., The Combination Mine	397, 435
Tin Deposits of Cape Prince of Wales		Collins, George E., A Fundamental Problem	79
Alchemy, A New, Editorial	793	Ditto, Professional Customs	491
Alderson, Matt W., Keeping Account of Supplies (I, II)	274, 340	Colorado, Lodes in the Tertiary Eruptives of	
Analysis, Technical Methods of, W. A. Seamon	249	T. A. Rickard	180
Antiquas, Editorial	120	Combination Mine, Edgar A. Collins	397, 435
Antimony, Uses of, Editorial	336	Compressed Air, Hose Connections	314
Apex, A Broad, 211, 567, 586		In Cyanidation, Andrew F. Crosse	560
Arbitration: Compulsory and Voluntary	311	Comstock Lode, The Great, G. McMillan	168
Argall, Philip, Cyanidation of Ore	709	Concentration of Silice, Wilton E. Darrow	268
Ditto, History of Cyanidation (I, II)	655, 682	Concluding Notes on Guanajuato, T. A. Rickard	83
Arrangement for Dumping Buckets, H. N. Herrick	533	Concrete, Re-enforced, Editorial	507
Arts, Secrecy in the, James Douglas	726	Tank to Store Tailing	237
Ash, Volcanic, Hiram W. Hixon	809	Conditions at Goldfield, Editorial	724
Assay-Furnace, Construction of a Gasoline		Congress, The Mining, Editorial	631
Wilton E. Darrow	749	Construction of a Gasoline Assay-Furnace	
Assessment Work, Edward A. Belcher	679	Of Wooden Trestles, R. Balfour	152
Ditto, Mark E. Davis	679	Converter Hood, L. S. Austin	400
Ditto, H. G. Hills	742	Converters, Hydraulically Operated, Copper	
Ditto, James Brindley Rowley	807	G. B. Shipley	375
Attachment Between Rope and Bucket, Charles B. Brodigan	467	Conveying Tailing in Launderers, G. A. Overstrom	332
Aubury, L. E., Black Sands and the Mining Bureau	396	Ditto, C. W. Van Law	457
Austin, L. S., The Laidst & Tanner Movable Converter		Tailing Through Pipe, C. W. Van Law	78
Hood	400	Copper, Editorial	374
Ditto, The McDonough Roasting Furnace	280	Converters, Hydraulically Operated, G. B. Shipley	375
Ditto, Smelter Smoke With a Discussion of Methods		In Chloride Solutions, Gustave Fernekes	592
for Lessening Its Injurious Effects	619	Market, Editorial	285
Austin, T. S., Silver-Lead Smelting Practice (V)	59	Situation, James Douglas	520
Australasia, Gold Output of, Editorial	143	Statistics, Editorial	574
Australia, Mining in, W. J. Loring	501	The Price of, Editorial	380
		Production of, Editorial	151
B		Secondary Ores of, H. E. West	141
Bad Ground, Sinking Through, F. W. Adgate	183	The Uses of, Editorial	215
Baker, Arthur, Esperanto	811	Core-Drill in Prospecting, The Diamond	
Balfour, R., Hints on Design of Wooden Trestles	152	Lewis T. Wright	461
Bancroft, George J., Ore Deposition	580	Corporation, Zinc, Editorial	222
Barnes-King Affair, Editorial	506	Correctives, Financial, Editorial	662
Ditto, R. B. Lamb	615	Cost of Filtering, E. Burt	645
Baszanger, Jacques, Carbons	788	Of Mining, Editorial	96
Beardley, G. F., The Blow-Out	458	Costs on the Rand, Ross E. Browne	113
Ditto, Furnace-Charging	593	Crisis, Financial, Henry A. Wise Wood	794
Beckett, F. S., A Handy Windlass	429	In San Francisco, Editorial	412
Belcher, Edward A., Assessment Work	679	Lessons of the, Editorial	566
Benitoite	175	Crosse, Andrew F., Compressed Air in Cyanidation	560
Bernewitz, M. W. von, Dumping Residue at		Crystals and Water in Veins, Editorial	190
Kalgoorlie	368	Cuchillo Parado District, R. H. Burrows	408
Big Nuggets	124	Cullinan Diamond, Editorial	221
Black Sands and the Mining Bureau, L. E. Aubury	396	Curiosities of Mining, Mark R. Lamb	521
Blaisdell Company, Tube-Mill Lining	775	Curie, J. H., Present Status of the Gold Mining	
Pressure Filter	188	Industry, Andrew F. Crosse	147
Blast-Furnaces, The Charging of, E. H. Messiter	528	Cyanidation, Compressed Air in, Philip Argall	560
Blow-Out, G. F. Beardley	458	History of (I, II)	655, 682
Ditto, F. Lynwood Garrison	406	In Nevada, R. Stuart Browne	677
Bolse, The Verdict at, Editorial	129	In the Transvaal	78
Bosqui, F. L., Cyanide Practice at the Homestake		Ditto, G. A. Denny	111
Mills	31	Of Ore Containing Both Coarse and Fine Gold	
Brady, John E., Inventions	632	Ditto, Philip Argall	709
British Workers, The Rejected, Edgar P. Rathbone	17	Ditto, E. M. Hamilton	775
Broad Apex, 214, 567, 586		Ditto, Edward H. Nutter	742
Brockunier, S. H., The Fairmont Explosion	809	Ditto, C. W. Van Law	712
Brodigan, Charles B., Attachment Between Rope and		Sliming Ore for, Mark R. Lamb	638
Bucket	467	With the Brown Vat, Francisco Narvaez	689
Brown Vat, Cyanidation With the, Francisco Narvaez	649	Cyanide Filter, The Burt Rapid, E. Burt	717
Browne, Ross E., Working Costs on the Rand	113	Practice at Copala, Dana G. Putnam	645
Browne, R. Stuart, Cyanidation in Nevada	677	Practice at the Homestake Mills, F. L. Bosqui	21
Buildings and Mining Education, Mining, C. O'Brien	363		
Burrows, R. H., The Cuchillo Parado District	408	D	
Burt, E., Cost of Filtering	645	Daniels, Joseph, Deep Thinking	521
Ditto, The Burt Rapid Cyanide Filter	717	Darlen Mine, Caving System at the, A. B. Chase	238
		Darrow, Wilton E., Concentration of Silice	268
C		Ditto, Construction of a Gasoline Assay-Furnace	749
California, Coal Mining in	186	Ditto, Testing Mill-Tailing	390
Opening of the New Mining Building at the Univer-		Daue, Edwin O., A Portable Acetylene Mine-Lamp	26
sity of	270	Davis, Mark E., Assessment Work	679
Ore Testing Company	272	Dawson, Dredging at, Editorial	507
Some Ore Deposits in the Inyo Range		Deedson, An Important Mineral Land	123
John A. Reid	80	Deep Thinking, Joseph Daniels	521
Miners Association	476	Definitions, Standards and, Editorial	759
Camp Bird Mine	466	De Kalb, Courtenay, Professional Customs	189
Capitalization of Rand Mines, Thos. H. Leggett	551	Ditto, To Young Men	561
Ditto, W. Fletcher Wilkinson	773	Del Mar, Alexander, The Mines of Roman Britain	28
Carbons, Jacques Baszanger	788	Ditto, The Nile as a Mining River	163
Card System of Mine Accounts, R. S. Handy	50	Demond, C. D., Weight of Water per Cubic Foot	620
Care of Mercury, The Use and	216	Dennis, Clifford G., Rare Mercury Ores	92
Cariboo, Hydraulic Mining in, Douglas Waterman	202	Denny, G. A., Cyanidation in the Transvaal	111
Caving System at the Darlen Mine, A. B. Chase	238	Denver Grant Smelter at, Editorial	411
Of Mining, The Dome of Equilibrium and the		Deputy Mineral Surveyor, Mining Location by	
Claude T. Rice	85	Editorial	599
Centrifugal Pumps	94	Desert Mill, A. R. Parsons	194
Roller Quartz Mill With Central Feed	736	Design of Wooden Trestles, R. Balfour	152
Change-Rooms, Editorial	221	Determination of Fluorine, G. A. Heberlein	591

	PAGE
Diamonds, Brazilian	24
Diente, Mexico	E. McCormick. 648
Directory of Directors	Editorial. 32
Distances in Nevada, Road	748
Diving Rod, Use of the	500
Dome of Equilibrium and the Caving System	85
Douglas, James	Claude T. Rice. 526
Ditto	Copper Situation. 726
Ditto	Secrecy in the Arts. 58
Downtown District, The Leadville	Editorial. 507
Dredging at Dawson	Editorial. 16
Dressing Plates in a Mill	H. P. Gordon. 808
Drill-Sharpener	T. H. Proske. 533
Dumping Buckets, Arrangements for	H. N. Herrick. 368
Residue at Kalgoorlie	M. W. von Bernwitz. 773
Dynamite, Thawing	Francis A. Thompson. 773

E

Eakle, Arthur S.	Weathered Pyrite. 492
Earthquake, The Jamaica	690
Report on Effects of the San Francisco	396
Economy in Mining Operations	Thomas E. Lambert. 341
Of Power in Crushing Ore	Ernest A. Hersam. 621
Editorial	The Barnes-King Affair. 506
Ditto	A Broad Apex. 567
Ditto	Abandoned Project. 2
Ditto	Change-Rooms. 221
Ditto	Conditions at Goldfield. 724
Ditto	Copper Market. 285
Ditto	Copper Statistics. 538
Ditto	Cost of Mining. 96
Ditto	Crisis in San Francisco. 412
Ditto	Crystals and Water in Veins. 190
Ditto	Directory of Directors. 32
Ditto	Dredging at Dawson. 507
Ditto	Electrical Smelting of Iron Ore. 31, 65
Ditto	English Rand. 2
Ditto	Fatalities in Coal Mines. 792
Ditto	Federal Troops in Labor Troubles. 723
Ditto	Financial Correctives. 662
Ditto	Geology of Leadville. 381
Ditto	Gold and Silver Production in the United States. 539
Ditto	Gold Mining Reviewed. 128
Ditto	Gold Output of Australasia. 443
Ditto	Gold Output of Rhodesia. 189
Ditto	Goldfield Consolidated Report. 758
Ditto	Grant Smelter at Denver. 411
Ditto	Greatest Gold Mine. 412
Ditto	Green Gold. 348
Ditto	Greenwater. 316
Ditto	Hearst Memorial. 254
Ditto	Humors of the Stringency. 630
Ditto	Indexes. 222
Ditto	Institute and Advertising. 348
Ditto	Late Unpleasantness. 725
Ditto	Lawlessness and Romance. 223
Ditto	Lessons of the Crisis. 566
Ditto	Lost Bullion Spanish Mines. 253, 286
Ditto	Mine Salting. 475
Ditto	Mining Congress. 631
Ditto	Mining, The Cost of. 96
Ditto	Mining Location by Deputy Mineral Surveyor. 599
Ditto	Mint Purchases of Silver. 3
Ditto	Natural Resources and Railroads. 316
Ditto	New Alchemy. 793
Ditto	On the Margin. 538
Ditto	Ore Deposition. 64
Ditto	Ore Market. 662
Ditto	Periodicity of Panics. 663
Ditto	Pioche. 158
Ditto	Presidential Message. 695
Ditto	Price of Copper. 380
Ditto	Production of Gold and Silver in the United States. 539
Ditto	Professional Customs. 474
Ditto	Question of Policy. 792
Ditto	Re-enforced Concrete. 507
Ditto	Rhodesian Gold Output. 189
Ditto	Robinson Gold Mine. 412
Ditto	Roosevelt and Newspapers. 285
Ditto	Royal School of Mines. 96
Ditto	Scare Head-Lines. 347
Ditto	Smelter Smoke. 442
Ditto	Speculation or Investment. 442
Ditto	Stamp Duty on the Rand. 565
Ditto	Standards and Definitions. 759
Ditto	Stock Market. 506
Ditto	Study of Ore Deposits. 32
Ditto	That \$29,240,000 Fine. 159
Ditto	Treatment of Silicious Ore. 694
Ditto	Triumph of San Francisco. 567
Ditto	Turbine Steam-Engineering. 347
Ditto	Verdict at Boise. 129
Ditto	Wall Street. 598, 693
Ditto	Wild-Cat and High Grading. 159
Ditto	Zinc Corporation. 222
Education, Engineering	T. A. Rickard. 664
Of Mining Engineers	T. A. Rickard. 275
Mining Buildings and Mining	C. O'Brien. 363
Effects of the San Francisco Earthquake on Structural Materials	396
Egypt, Gold Mining in	C. S. Herzig. 212
Elevators as Liquid Elevators	62
El Doctor, The Mines of	T. D. Murphy. 241
Electric Age	304
Zinc Smelting	Frederick T. Snyder. 720
Ditto	R. L. Phelps. 87
Electrically Operated Hoist With Reels	156
Emmons, S. F.	Genesis of the Ores of Leadville. 401
Ditto	Suggestions for Field Observations. 18
Employees Underground, Rules for	R. Chester Turner. 493
Engineering Education	664
Engineer's Guarantee	B. M. 301
Erosion and Oxidation in Sonora	F. J. H. Merrill. 268

F

Fairchild Vacuum-Filter	279
Fairmont Explosion	S. H. Brockunier. 809
Fast Sinking	P. S. Williams. 521
Fatalities in Coal Mines	Editorial. 792
Faulting in the Red Cloud Mine	H. W. Turner. 747
Fay, Albert Hill, Tin Deposits of Capo Prince of Wales, Alaska	744
Federal Troops in Labor Troubles	Editorial. 723

Fearn, Percy L.	Professional Customs. 614
Feed for Tube-Mills, Spiral	Paul O. Abbe. 62
Ferneckes, Gustave	Copper in Chloride Solutions. 592
Field Observations of Ore Deposits, Suggestions for	S. F. Emmons. 18
Filtering, Cost of	E. Burt. 645
Filters, The Vacuum Slime	A. G. Kirby. 46
Financial Correctives	Editorial. 662
Crisis	Henry A. Wise Wood. 794
Flue, Quick Repairs to a Smoke	C. A. Heberlein. 151
Fluorine, Determination of	T. Skewes-Saunders. 591
Foreman, The Mine	648
Forests, The National	370
Forstner, William	Ore Deposits in Serpentine. 121
Ditto	Weathered Pyrite. 322
Fraser, Lee	Re-timbering the Kearsarge Shaft. 432
Fundamental Problem	James W. Abbott. 143
Ditto	George E. Collins. 79
Ditto	Howard D. Smith. 174
Ditto	North Star. 300
Ditto	S. T. 206
Fundicion Smelter, Notes on the	91
Furnace, The McDougal Roasting	L. S. Austin. 280
Charging	G. F. Beardsley. 592
Furnaces, The Charging of Blast	E. H. Messiter. 528

G

Garrison, F. Lynwood	The Blow-Out. 406
Ditto	Metallic Sulphides in the Tufts of Santo Domingo. 305
Ditto	Professional Customs. 552
Ditto	The Royal School of Mines. 111
Gasoline Assay-Furnace, Construction of	Wilton E. Darrow. 749
Genesis of Ores	Horace V. Winchell. 55
Of the Ores of Leadville	S. F. Emmons. 401
Geological Survey on Effects of the San Francisco Earthquake	396
Survey Work as Applied to the Mining Industry	George Otis Smith. 652
Geology of the Coffee Creek District	Norman S. Stines. 25
Of Jamaica, as Related to Its History	Rossiter W. Raymond. 145
Gold and Silver, History of the	James W. Malcolmson. 784
And Silver Production in the United States	Editorial. 539
Bullion, Melting, and Refining of	Gerard W. Williams. 277
Measures of Tangier, Nova Scotia	George A. Packard. 430
Mine, The Greatest	Editorial. 412
Mining in Egypt	C. S. Herzig. 212
Mining Industry, Present Status of the	J. H. Curle. 147
Mining Reviewed	Editorial. 128
Ore, Mechanical Treatment of	W. J. Adams. 374
Output of Australasia	Editorial. 443
Output of Rhodesia	Editorial. 189
Goldfield, Conditions at	Editorial. 724
Consolidated Report	Editorial. 758
Goodyear, N.	Acetylene Lighting. 460
Gordon, H. P.	Dressing Plates in a Mill. 16
Graduates, Mining Schools and Their	George A. Packard. 173
Ditto	One of Them. 237
Great Comstock Lode	G. McM. Ross. 468
Greatest Gold Mine	Editorial. 412
Green Gold	Editorial. 348
Ditto	Frank A. Leach. 363
Ditto	T. K. Rose. 645
Greenwater	Editorial. 316
Guanajuato, Concluding Notes on	T. A. Rickard. 83
Tube-Mills at	C. W. Van Law. 205

H

Hamilton, E. M.	Cyanidation of Ore Containing Both Coarse and Fine Gold. 775
Handling Residue	459
Handy, R. S.	A Card System of Mine Accounts. 50
Handy Windlass	F. S. Beckett. 429
Hang-Fire	F. T. Howes. 807
Hardinge, H. W.	Tube-Mill Lining. 645
Hearst Memorial	Editorial. 254
Heat From Fuel v. Electric Heat	246
Heberlein, C. A.	Determination of Fluorine. 591
Herrick, H. N.	Arrangement for Dumping Buckets. 533
Hersam, Ernest A.	Economy of Power in Crushing Ore. 621
Herzig, C. S.	Gold Mining in Egypt. 212
Ditto	Professional Customs. 740
Hewett, Foster	Professional Customs. 677
Hills, H. G.	Assessment Work. 742
Hints on the Design of Wooden Trestles	R. Balfour. 153
History of Cyanidation (I. II)	Philip Argall. 653, 682
History of Gold and Silver	James W. Malcolmson. 784
Ditto	Volcanic Ash. 809
Hoisting With Light Equipment, Rapid	George A. Packard. 470
Homestake Mill, Improvements in the	812
Mills, Cyanide Practice at the	F. L. Bosque. 21
Howes, F. T.	Hang-Fire. 807
Hutchins, G. P.	Power Transmission by Manila Rope. 440
Hydraulic Equipment of the Old Channel Mines	John M. Nicol. 333
Mining in Cariboo	Douglas Waterman. 302
Hydraulically Operated, Copper Converters	G. B. Shipley. 375

I

Improvements in the Homestake Mill	812
Indexes	Editorial. 222
The Uses of	Rossiter W. Raymond. 239
Institute and Advertising	Editorial. 348
Inventions	John E. Brady. 632
Investment, Speculation or	F. E. Wilson. 427
Inyo Range, California, Some Ore Deposits in the	John A. Reid. 80
Iron Ore, The Electrical Smelting of	Editorial. 31, 65
Ditto	R. L. Phelps. 87

J

Jamaica, As Related to Its History, Geology of	Rossiter W. Raymond. 145
Japanese Mining Laws	811
Jigging by Hand	Arthur C. Nahl. 557

K

Kalgoorlie, Dumping Residue at.....	368
M. W. von Bernewitz.....	368
Kearsarge Shaft, Re-timbering the.....	432
Lee Fraser.....	432
Keeping Account of Supplies (I, II).....	274, 310
Matt. W. Alderson.....	274, 310
Kennedy, J.....	555
Notes on Tube-Mills.....	555
Kirby, A. G.....	46
Vacuum Slime-Filters.....	46
Knight, C. Y.....	580
A Sampler Wanted.....	580
Koch, Walter E.....	300
Ore Deposition.....	300
Kress, H. H.....	471
Transport of Machinery in Mountainous Countries.....	471

L

Laist & Tanner Movable Converter Hood.....	400
L. S. Austin.....	400
Lamb, Mark R.....	521
The Curiosities of Mining.....	521
Ditto.....	521
Sliming Ore for Cyanidation.....	521
Lamb, R. B.....	613
The Barnes-King Affair.....	613
Lambert, Thomas E.....	341
Economy in Mining Operations.....	341
Lamp, A Portable Acetylene Mine.....	26
Edwin O. Daue.....	26
Launders, Conveying Tailing In.....	332
G. A. Overstrom.....	332
Ditto.....	332
C. W. Van Law.....	332
Laws, Japanese Mining.....	811
Rules for Employees.....	811
Lawrence, Augustine.....	551
Professional Customs.....	551
Leach, Frank A.....	363
Green Gold.....	363
Leadville, Downtown District.....	58
Genesis of the Ores of.....	58
S. F. Emmons.....	58
The Geology of.....	58
Editorial.....	58
Leggett, Thos. H.....	551
Capitalization of Rand Mines.....	551
Ditto.....	551
The Requirements of Modern Mining.....	551
Life of Mine Timbers, Prolonging.....	816
John W. Nelson.....	816
Lifting Magnets.....	755
Lighting, Acetylene.....	460
N. Goodyear.....	460
Lindgren, Waldemar.....	207
The Relation of Ore Deposition to Physical Conditions.....	207
Ditto.....	207
Blaisdell Company.....	207
Ditto.....	207
H. W. Harding.....	207
Ditto.....	207
C. E. Rhodes.....	207
Location by Deputy Mineral Surveyor.....	599
Editorial.....	599
Locators to Cut Timber, Right of Mining.....	158
Lodes in the Tertiary Eruptives in Colorado.....	180
T. A. Rickard.....	180
Loring, Frank C.....	514
Cobalt.....	514
Loring, W. J.....	501
Mining in Australia.....	501
Ditto.....	501
On Technical Writing.....	501
Lost Bullion Spanish Mines.....	253, 286
Editorial.....	253, 286
Lyser, Chas. J.....	810
Professional Customs.....	810

M

MacFarren, H. W.....	677
A Sampler.....	677
Mack, R. L. and G. H. Selbrd.....	777
The Roasting of Telluride Ores (I, II).....	777
Ditto.....	777
Make-Shift Stamp-Mill.....	783
History of Gold and Silver.....	783
Malcolmson, James W.....	440
Power Transmission by.....	440
G. P. Hutchins.....	440
Map, A New California.....	84
Filling System of.....	84
G. N. Pfeiffer.....	84
Margin, On the.....	528
Editorial.....	528
Market, Copper.....	285
Editorial.....	285
Maynard, Geo. W.....	810
Professional Customs.....	810
McCormick, E.....	812
Mining Under Adverse Circumstances.....	812
McDermott, Walter.....	331
The Royal School of Mines.....	331
McDonald Roasting Furnace.....	280
L. S. Austin.....	280
McLaughlin, A. G.....	710
Wall Street.....	710
McNair, F. N.....	127
Plumbing a Deep Shaft.....	127
Measuring Industrial Temperatures.....	712
Thomas T. Read.....	712
Mechanical Treatment of Gold Ore.....	371
W. J. Adams.....	371
Mercury Ores, Rare.....	92
Clifford G. Dennis.....	92
Mercury, The Use and Care of.....	216
Merrill, F. J. H.....	268
Erosion and Oxidation in Sonora.....	268
Messiter, E. H.....	528
The Charging of Blast-Furnaces.....	528
Metallic Sulphides in the Tufts of Santo Domingo.....	305
F. Lynwood Garrison.....	305
Methods in Mexico, Old.....	372
Of Advertising.....	372
Charles S. Palmer.....	372
Of Analysis, Technical.....	372
W. A. Seamon.....	372
Mexican Railroad Tariff.....	195
H. A.....	195
Mexico, Old Methods in.....	372
Mill, Cyanide Practice at Homestake.....	21
F. I. Bosqui.....	21
The Desert.....	191
A. R. Parsons.....	191
Dressing Plates in a.....	16
H. P. Gordon.....	16
Tailing, Testing.....	300
Wilton E. Darrow.....	300
Mine Accounts, A Card System of.....	50
R. S. Hands.....	50
Camp Bird.....	166
Caving System at the Darien.....	238
A. R. Chace.....	238
Combination.....	397, 435
Edgar A. Collins.....	397, 435
Faulting in the Red Cloud.....	747
H. W. Turner.....	747
Foreman.....	648
T. Skewes-Saunders.....	648
Timbers, Prolonging the Life of.....	816
John W. Nelson.....	816
Miner, A Word for the.....	773
R. S. W.....	773
Mineral in Underground Waters.....	590
Land—An Important Decision.....	122
Mines of Roman Britain.....	28
Alexander Del Mar.....	28
Of El Doctor.....	241
T. D. Murphy.....	241
Treadwell Group of.....	116
Arthur C. Spencer.....	116
Mining, A Question of Practical.....	16
Francis A. Thomson.....	16
Buildings and Mining Education.....	363
C. O'Brien.....	363
Bureau, Black Sands and the.....	395
L. E. Aubury.....	395
Congress.....	631
Editorial.....	631
The Cost of.....	236
Editorial.....	236
Curiosities of.....	521
Mark R. Lamb.....	521
Engineers, Education of.....	275
T. A. Rickard.....	275
In Australasia.....	616
H. L. Wilkinson.....	616
In Australia.....	501
W. J. Loring.....	501
In Cariboo, Hydraulic.....	302
Douglas Waterman.....	302
In Egypt, Gold.....	212
C. S. Herzog.....	212
In New South Wales.....	182
In Quebec.....	658
Industry, Present Status of the Gold.....	147
J. H. Curle.....	147
Laws, Japanese.....	811
Location by Deputy Mineral Surveyor.....	599
Editorial.....	599
Operations, Economy in.....	341
Thomas E. Lambert.....	341
Requirements of Modern.....	16
Thos. H. Leggett.....	16
Schools and Their Graduates.....	173
Geo. A. Packard.....	173
Ditto.....	173
One of Them.....	237
Under Adverse Circumstances.....	812
E. McCormick.....	812
Mint Purchases of Silver.....	3
Editorial.....	3
Moore, E.....	589
A Suggestion to Road Supervisors.....	589
Mt. Morgan Mine.....	524
Mountainous Countries, Transport of Machinery in.....	471
H. H. Kress.....	471
Murphy, T. D.....	241
The Mines of El Doctor.....	241

N

Nahl, Arthur C.....	557
Jigging by Hand.....	557
Narvaez, Francisco.....	689
Cyanidation with the Brown Vat.....	689
Neill, James W.....	114
An Abandoned Project.....	114
Ditto.....	678
Professional Customs.....	678
Nelson, John W.....	816
Prolonging Life of Mine-Timbers.....	816
Nevada, Cyanidation in.....	677
R. Stuart Browne.....	677
Ploche.....	176
James W. Abbott.....	176
Road Distances in.....	748
Nicholas, Askin M.....	583, 715
Slime Treatment.....	583, 715
Nichols, Ralph.....	582
Professional Customs.....	582
Nicol, John M.....	333
The Hydraulic Equipment of the Old Channel Mines.....	333
Nile as a Mining River.....	163
Alexander Del Mar.....	163
Notes on the Fundicion Smelter.....	91
On Guanajuato, Concluding.....	83
T. A. Rickard.....	83
On Smoke Suits.....	30
J. Kennedy.....	30
Nova Scotia, Gold Measures of Tangier.....	430
George A. Packard.....	430
Nutter, Edward H.....	742
Cyanidation of Ore Containing Both Coarse and Fine Gold.....	742

O

Oaxaca, A Correction.....	143
L. R. Hamer.....	143
O'Brien, C.....	363
Mining Buildings and Mining Education.....	363
Oil in the State of Vera Cruz.....	217
Ezequiel Ordóñez.....	217
Old Channel Mines, The Hydraulic Equipment of the.....	333
John M. Nicol.....	333
Oldfield, Frank W.....	807
A Sampler.....	807
On Technical Writing.....	331
W. J. Loring.....	331
Opening of the New Mining Building at the University of California.....	270
Ordóñez, Ezequiel.....	217
Oil in the State of Vera Cruz.....	217
Ore Containing Both Coarse and Fine Gold, Cyanidation of.....	709
Philip Argall.....	709
Deposition.....	580
George J. Bancroft.....	580
Ditto.....	580
Editorial.....	580
Deposition to Physical Conditions, Relation of.....	207
Waldemar Lindgren.....	207
Deposits in the Inyo Range, California.....	80
John A. Reid.....	80
Deposits in Serpentine.....	141
William Forstner.....	141
Deposits, The Study of.....	32
Editorial.....	32
Deposits, Suggestions for Field Observations of.....	18
S. F. Emmons.....	18
Overstrom, G. A.....	332
Conveying Tailing in Launderers.....	332
Oxidation in Sonora, Erosion and.....	268
F. H. J. Merrill.....	268

P

Packard, George A.....	430
Gold Measures of Tangier, Nova Scotia.....	430
Ditto.....	430
Mining Schools and their Graduates.....	173
Ditto.....	646
Professional Customs.....	646
Ditto.....	470
Rapid Hoisting with Light Equipment.....	470
Palmer, Charles S.....	157
Methods of Advertising.....	157
Parsons, A. R.....	191
The Desert Mill.....	191
Pfeiffer, G. N.....	84
System of Map-Filling.....	84
Phelps, R. L.....	87
The Electrical Smelting of Iron Ore.....	87
Ditto.....	782
The Tyee Smelter.....	782
Ploche.....	176
Editorial.....	176
Nevada.....	176
James W. Abbott.....	176
Plumbing a Deep Shaft.....	127
F. W. McNair.....	127
Possibilities and Limitations of Geological Survey Work.....	652
George Otis Smith.....	652
Power Transmission by Manila Rope.....	440
G. P. Hutchins.....	440
Practical Miner, Questions by a.....	581
W. E. T.....	581
Ditto.....	581
H. C. C.....	581
Mining, A Question of.....	16
Francis A. Thomson.....	16
Present Status of the Gold Mining Industry.....	147
J. H. Curle.....	147
President's Message.....	698
Editorial.....	698
Professional Customs.....	341
James W. Abbott.....	341
Ditto.....	191
George E. Collins.....	191
Ditto.....	191
Howard D. Smith.....	191
Ditto.....	191
S. T.....	191
Production of Copper.....	340
Of Gold and Silver in the United States.....	340
Editorial.....	340
Of Lead.....	340
Of Spelter.....	340
Professional Customs.....	341
James W. Abbott.....	341
Ditto.....	341
F. W. B.....	341
Ditto.....	341
Charles E. Dickinson & Co.....	341
Ditto.....	341
George E. Collins.....	341
Ditto.....	341
Courtenay D. Kallie.....	341
Ditto.....	341
Editorial.....	341
Ditto.....	341
B. L. Fearn.....	341
Ditto.....	341
F. Lynwood Garrison.....	341
Ditto.....	341
C. S. Herzog.....	341
Ditto.....	341
Foster H. W.....	341
Ditto.....	341
B. L. Fearn.....	341
Ditto.....	341
Chas. J. Lyser.....	341
Ditto.....	341
George W. Maynard.....	341
Ditto.....	341
N.....	341
Ditto.....	341
James W. Neill.....	341
Ditto.....	341
Ralph Nichols.....	341
Ditto.....	341
George A. Packard.....	341
Ditto.....	341
Frank H. Probert.....	341
Ditto.....	341
Forbes Rickard.....	341
Ditto.....	341
Alex. Roy.....	341
Ditto.....	341
H. P. S.....	341
Ditto.....	341
T. S.....	341
Ditto.....	341
F. L. Sizer.....	341
Ditto.....	341
R. H. Symington.....	341
Ditto.....	341
H. W. Turner.....	341
Ditto.....	341
R. Chester Turner.....	341
Ditto.....	341
Norval J. E. Welsh.....	341
Ditto.....	341
Progress on the Rand.....	141
John Yates.....	141
Prolonging the Life of Mine Timbers.....	816
John W. Nelson.....	816
Proske, T. H.....	808
Drill-Sharpshooters.....	808
Prospector and His Friends.....	680
Putnam, Dana G.....	645
Cyanide Practice at Capatzen.....	645
Pyrite, Weathered.....	492
Arthur S. Eakle.....	492
Ditto.....	492
William Forstner.....	492

Q

Quebec, Mining in.....	658
Questions by a Practical Miner.....	581
Ditto.....	581
H. C. C.....	581
Ditto.....	581
W. E. T.....	581
Searching.....	581
T. S.....	581
Quick Repairs to a Smoke Flue.....	338

R

Radium in the Rocks of the Simpon	685
Railroad Tariff, Mexican	H. A. 395
Railroads, Natural Resources and	Editorial 316
Rand, and Comparisons With Mines in California	113
Mines, Capitalization of	Ross E. Browne 551
Thomas H. Leggett	551
W. Fischer Wilkinson	773
John Yates	434
Progress on the	Clifford G. Dennis 92
Rare Mercury Ores	17
Rathbone, Edgar P.	The Rejected British Workers 17
Raymond, Rossiter W.	Geology of Jamaica, as Related to Its History 145
The Uses of Indexes	239
Read, Thomas T.	Measuring Industrial Temperatures 712
Record Sinking	438
Red Cloud Mine, Faulting in the	H. W. Turner 747
Reduction of Quicksilver	151
Refining of Gold Bullion	Gerard W. Williams 277
Reid, John A.	Ore Deposits in the Inyo Range 80
Rejected British Workers	Edgar P. Rathbone 17
Relation of Ore-Deposition to Physical Conditions	207
Waldemar Lindgren	207
Repairs to a Smoke-Flue, Quick	338
Requirements of Modern Mining	Thos. H. Leggett 16
Residue at Kalgoolie, Dumping	368
Re-timbering the Kearsarge Shaft	Lee Fraser 432
Rhodes, C. E.	Tube-Mill Lining 775
Rice, Claude T.	The Dome of Equilibrium and the Caving System of Mining 85
Square-Set Mining and a Modification of It	365
Rickard, Forbes	Professional Customs 521
Rickard, T. A.	Concluding Notes on Guanajuato 83
Education of Mining Engineers	275
Lodes in the Tertiary Eruptives of Colorado	180
Right of Mining Locators to Cut Timber in Public Domain	458
Road Distances in Nevada	748
Roasting of Telluride Ores	751, 777
R. L. Mack and G. H. Seibold (I, II)	751, 777
Roman Britain, The Mines and Agriculture of	28
Alexander Del Mar	28
Rose, T. K.	Green Gold 615
Ross, G. McM.	The Great Comstock Lode 468
Rowley, James Brindley	Assessment Work 807
Roy, Alex.	Professional Customs 552
Royal School of Mines	Editorial 96
F. Lynwood Garrison	111
Walter McDermott	331
W. Fischer Wilkinson	268
Rules for the Guidance of Employees	773
Augustine Lawrence	773
R. Chester Turner	493

S

Salting, Mine	Editorial 475
Sampler	H. W. MacFarren 677
Frank W. Oldfield	807
C. Y. Knight	580
Santo Domingo, Metallic Sulphides in the Tufts of	305
F. Lynwood Garrison	305
Seibold, G. H. and R. L. Mack	The Roasting of Telluride Ores (I, II) 151, 777
Seamon, W. A.	Technical Methods of Analysis 249
Searching Questions	T. S. 428
Secondary Ores of Copper	H. E. West 144
Secrecy in the Arts	James Douglas 726
Serpentine, Ore Deposits in	William Forstner 121
Shaft, Plumbing a Deep	F. W. McNair 427
Re-timbering the Kearsarge	Lee Fraser 432
Shipley, G. B.	Copper Converters, Hydraulically Operated 375
Silicious Ore, Treatment of	Editorial 694
Silver, History of Gold and	James W. Malcolmson 784
Lead Smelting Practice (V)	T. S. Austin 59
Mint Purchases of	Editorial 3
Production in the United States, Gold and	Editorial 539
Simpon, Radium in the Rocks of the	685
Sinking, Record	438
Through Bad Ground	F. W. Adgate 183
Sizer, F. L.	Professional Customs 740
Skewes-Saunders, T.	The Mine-Foreman 618
Slag-Dam	F. M. Smith 205
Dams	Hiram W. Hixon 553
Slime, Concentration of	Wilton E. Darrow 268
Filters, Vacuum	A. G. Kirby 46
Treatment	Askin M. Nicholas 583, 715
Treatment at Kalgoolie	M. W. von Bernewitz 743
Sliming Ore for Cyanidation	Mark R. Lamb 658
Smelter at Denver, The Grant	Editorial 411
Smoke	Editorial 442
Smoke With a Discussion of Methods for Lessening Effects	L. S. Austin 649
Type	Ralph L. Phelps 782
Smelting, Electric Zinc	Frederick T. Snyder 720
Practice, Silver-Lead (V)	T. S. Austin 59
Of Iron Ore, Electrical	Editorial 31, 65
Ditto	R. L. Phelps 87
Smith, F. M.	Slag-Dam 205
Smith, George Otis	Geological Survey Work as Applied to Mining 652
Smith, Howard D.	A Fundamental Problem 174
Smoke-Flue, Quick Repairs to a	338
Suits, Notes on	90
Snyder, Frederick T.	Electric Zinc Smelting 720
Solutions, Copper in Chloride	Gustave Fernekes 592
Some Ore Deposits in the Inyo Range, California	80
John A. Reid	80
Sonora, Erosion and Oxidation in	F. J. H. Merrill 268
Speculation or Investment	Editorial 442
F. E. Wilson	427
Spencer, Arthur C.	The Treadwell Group of Mines 117
Spiral Feed for Tube-Mills	Paul O. Abbe 62
Spokane, A Tin Deposit Near	A. R. Whitman 49
Square-Set Mining and a Modification of It	Claude T. Rice 365
Status of the Gold Mining Industry, Present	J. H. Currie 147
Stines, Norman S.	The Geology of the Coffee Creek Mining District 25
Suggestion to Road Supervisors	E. Moore 580
Suggestions for Field Observations of Ore Deposits	S. F. Emmons 18
Sulphides in the Tufts of Santo Domingo, Metallic	F. Lynwood Garrison 305

Supplies, Keeping Account of (I, II)	Matt. W. Alderson 274, 340
Surveyor, Mining Locations by Deputy Mineral	Editorial 599
Symington, R. B.	Professional Customs 553
T	
Tailing, A Concrete Tank to Store	337
In Launderers, Conveying	G. A. Overstrom 332
Ditto	C. W. Van Law 457
Throph Pipe, Conveying	C. W. Van Law 78
Tangler, Nova Scotia, Gold Measures of	George A. Packard 430
Writing, On	W. A. Seamon 249
Telluride Ores, The Roasting of (I, II)	R. L. Mack and G. H. Seibold 751, 777
Temperatures, Measuring Industrial	Thomas T. Read 712
Tertiary Eruptives of Colorado, Lodes in the	T. A. Rickard 180
Testing a Water-Gate	628
Mill-Tailing	Wilton E. Darrow 300
Thawing Dynamite	Francis A. Thomson 773
Thomson, Francis A.	Thawing Dynamite 773
A Question of Practical Mining	46
Timber-Framing Machine, An Improved	126
In Public Domain for Mining Purposes, Right of Mining Locators to Cut	458
Timbers, Prolonging the Life of Mine	John W. Nelson 816
Tin Deposit Near Spokane	A. R. Whitman 49
Deposits of Cape Prince of Wales, Alaska	744
Tinnebo, E. G.	Prospecting With the Diamond-Drill 807
Transvaal, Cyanidation in the	G. A. Denny 111
G. A. Denny	111
Treadwell Group of Mines	Arthur C. Spencer 117
Treatment of Gold Ore, Mechanical	W. J. Adams 374
Of Silicious Ore	Editorial 694
Of Slime	Askin M. Nicholas 583, 715
Trestles, Hints on the Design of Wooden	R. Balfour 152
Tube-Mill Feed	410
Mill Lining	466
Ditto	Blaisdell Company 775
Ditto	H. W. Hardinge 645
Ditto	C. E. Rhodes 775
Mills at Guanajuato	C. W. Van Law 205
Mills, Notes on	J. Kennedy 555
Mills, Spiral Feed for	Paul O. Abbe 62
Turner, H. W.	Faulting in the Red Cloud Mine 747
Professional Customs	523
Turner, R. Chester	Professional Customs 490
Rules for the Guidance of Employees	493
Underground	493
Tyee Smelter	Ralph L. Phelps 782
U	
United States Smelting, Refining & Mining Company	220
University of California, Opening of the New Mining Building of the	270
Uranium	560
Use and Care of Mercury	216
Of the Divining Rod	500
Uses of Antimony	336
Of Copper	215
Of Indexes	Rossiter W. Raymond 239
V	
Vacuum Filter, The Fairchild	279
Slime-Filters	A. G. Kirby 46
Vanadium in the United States	534
Van Law, C. W.	Conveying Tailing in Launderers 457
Conveying Tailing Through Pipe	78
Cyanidation of Ore Containing Both Coarse and Fine Gold	742
Tube-Mills at Guanajuato	205
Vat, Cyanidation With the Brown	Francisco Narvaez 689
Vera Cruz, Oil in the State of	Ezequiel Ordóñez 247
Volcanic Ash	Hiram W. Hixon 809
Von Bernewitz, M. W.	Slime Treatment at Kalgoolie 743
W	
Wall Street	Editorial 598, 693
Albert L. Clark	808
A. G. McLaughlin	710
Wanted, A Sampler	C. Y. Knight 580
Warwick, A. W.	Topographical and Other Notes on the Choix-Guadalupe y Calvo Mining Districts 686
Water Gauge, Automatic	284
In Veins, Crystals and	Editorial 190
Per Cubic Foot, Weight of	C. D. Demond 620
Waterman, Douglas	Hydraulic Mining in Cariboo 302
Waters, Mineral in Underground	590
Weathered Pyrite	Arthur S. Eakle 492
Diamond Drilling	774
Weight of Water per Cubic Foot	C. D. Demond 620
Welsh, Norval J. E.	Professional Customs 581
West, H. E.	Secondary Ores of Copper 144
Wilkinson, H. L.	Mining in Australasia 616
Wilkinson, W. Fischer	Capitalization of Rand Mines 773
Williams, Gerard W.	The Clean-Up, Melting, and Refining of Gold Bullion 277
Williams, P. S.	Fast Sinking 521
Wilson, F. E.	Speculation or Investment 427
Winchell, Horace V.	The Genesis of Ores 55
Windlass, A Handy	F. S. Beckett 429
Wisker, Aubrey L.	Absurdities of Promotion 205
What Happens When Advertising Stops	591
Whitman, A. R.	A Tin Deposit Near Spokane 49
Wood, Henry A. Wise	Financial Crisis 794
Word for the Miner	B. N. W. 773
Working Costs on the Rand and Comparisons	113
Wright, Lewis T.	Ross E. Browne 113
The Diamond Core-Drill in	461
Writing, On Technical	W. J. Loring 331
Y	
Yates, John	Progress on the Rand 434
Z	
Zinc Corporation	Editorial 222
Smelting, Electric	Frederick T. Snyder 720

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TABLE OF CONTENTS

Editorial:	Page.
Notes.....	1
An Abandoned Project.....	2
Mint Purchases of Silver.....	3
General Mining News.....	5
Special Correspondence.....	10
London.....	
Johannesburg, Transvaal.....	
Butte, Montana.....	
Denver, Colorado.....	
Mexico.....	
Joplin, Missouri.....	
Concentrates.....	15
Discussion:	
Dressing Plates in a Mill.....	16
The Requirements of Modern Mining.....	16
.....Thos. H. Leggett	16
The Rejected British Workers.....	17
.....Edgar P. Rathbone	17
Articles:	
Suggestions for Field Observations of Ore Deposits.....	18
.....S. F. Emmons	18
Cyanide Practice at the Homestake Mills.....	21
.....F. L. Bosqui	21
Brazilian Diamonds.....	24
The Geology of the Coffee Creek Mining District.....	25
.....Norman S. Stines	25
A Portable Acetylene Mine-Lamp.....	26
.....Edwin O. Daur	26
The Mines and Agriculture of Roman Britain.....	28
.....Alexander Del Mar	28
Mining and Metallurgical Patents.....	30
Decisions Relating to Mining.....	29
The Prospector.....	24
Departments:	
Personal.....	4
Dividends.....	4
A Big Pump.....	4
Books Received.....	4
Market Reports.....	4

Editorial.

WE SHARE the pleasure of this community in learning that Mr. Benjamin Ide Wheeler will remain President of the University of California despite the opportunity to become the executive head of the Massachusetts Institute of Technology. That a professor of Greek should have received the offer of the presidency of a technological college immediately after it had been declined by a professor of Latin goes to prove that men of scientific or technical training are not available for the purpose. It suggests either that professors of science lack executive ability or that successful technical men cannot afford to accept positions of this kind.

HOMESTAKE MILLING PRACTICE has become an altogether different procedure from what it used to be. Ten years ago the methods in use were mainly interesting for their incompleteness, but since Mr. C. W. Merrill became advisory metallurgist, the treatment, after stamping, has become not only modern but original. In filtering of slime and in other details of cyanidation (such as precipitation of the gold) Mr. Merrill has led the way by suggestive improvements. For these reasons we are glad to publish the excellent article by our friend Mr. F. L. Bosqui, himself an authority, as he is a specialist, on the cyanide process.

SUGGESTIONS FOR FIELD OBSERVATIONS are likely to be useful to mining engineers, and particularly when they are offered by such a geologist as Mr. S. F. Emmons. Hints of this kind are invaluable to the younger men in the profession, for they do most of the scouting for the veterans, whose duty it is mainly to make inferences from facts collected by their more active assistants. The three pages that Mr. Emmons has contributed will find their way into the notebooks of many of our readers, for they epitomize the main structural and chemical features of ore deposits. A few copies will be prepared in pamphlet form, for gratuitous distribution to those that ask for them.

OUR CORRESPONDENT at Johannesburg and Mr. Edgar P. Rathbone, late Inspector of Mines to the Transvaal Government, both contribute a few remarks upon the labor situation on the Rand. The cost of ordinary labor is the vital factor in large mining operations and at times we are apt to forget it when emphasizing the value of mechanical devices and new processes. The history of ancient mining demonstrates this vital fact, for forced labor ensured economy even without the mechanical appliances now deemed essential. Tube-mills and slime-filters at Johannesburg are secondary to Kaffir and coolie labor; the former may save one or two per cent in costs, the latter represent a saving of 10 or 20 per cent as compared to other labor available.

In most mining districts of the United States the labor cost represents from 65 to 80 per cent of the total expenditure at a mine. In Mexico it is 55 to 58 per cent.

OUR contemporary, *The Canadian Mining Journal*, contains an article on the Boston Richardson Mining Company's work in Nova Scotia. It does credit to the author, Mr. Percy Brown, and emphasizes the narrow margin under which gold is won from the 'saddle reefs' of the eastern Province of Canada. Furthermore, it testifies to careful management when ore yielding \$2.70 can be exploited to advantage.

ABSOLUTE STAGNATION marks the mining business of London at the present time. Ever since the war South African shares have been declining until now the hopes of a revival have vanished. The recent labor disturbances have had a bad effect, although this is a small and temporary factor as compared to the interference of the Liberal Government with the regulation of Chinese labor. All the speculators except the biggest financiers have seen their profits vanish, and many men that came home from the Rand with a handsome competence are now facing poverty. In the Siberian department there has been a collapse, and in the Australian stocks the failure of the plans of the Zinc Corporation and the Deep Leads has had a bad effect. On the whole, the mining market is under the gloom of a funereal fog. It is a time of reaction from excessive speculation. Happier days will come after a period of readjustment.

AN ENGLISH RAND is the alluring title of a supposititious goldfield in Gloucestershire. Our London correspondent has referred to some of the incidents connected with this interesting episode in British mine speculation. It has all the characteristics of former funny happenings. In the first place the Chastan Syndicate, which is the company of issue, has for its chairman Admiral Sir Henry F. Nicholson, K. C. B., undoubtedly a worthy sailor and a skillful commander, but sadly out of place as the head of a scheme to dig gold out of the ground. Now, if R. T. Bayliss, Walter McDermott, Edgar Taylor, J. H. Curle, or some other knowing gentleman, someone saturated with experience in the various forms of gold mining, had been selected as chairman, we would have considered it a strong point—but these Admirals, Generals, and noble Earls that lend themselves to industrial enterprises have no sense of humor. They are plainly absurd. It ought to be recognized that such practices become serious when good names are used as lures for subscriptions to stock and as a guaranty of respectable business. They succeed in their first purpose and fail wholly as to the second. However, that is another story. The English Rand, as this gold-bearing territory in Gloucestershire is labeled, has been examined by several engineers. The property covers leases aggregating 1,814 acres and "commands the reef" for 12 miles. There is a persistent layer of conglomerate; it is said to be like the blanket of the Rand and West Africa; it is said to be uniformly gold-bearing; it is

claimed to be rich enough to be profitably exploited. The first of these statements meets with undoubted confirmation; the second is affirmed without objection; the third is doubted; the fourth is vigorously denied. After the shares had fluctuated wildly on the Stock Exchange a firm of reputable engineers was engaged by leading shareholders, and the report was unfavorable. Messrs. McCarthy and Halse took samples and found the conglomerate to contain 6 grains of gold (that is, about 24 cents) per ton, in other words, they confirmed the geological occurrence of a large body of gold-bearing conglomerate and disproved the supposition that it could be made the basis of a profitable mining enterprise. Thereupon, the directors tried to excuse the finding of these engineers by stating that the samples were "taken absolutely from the surface and very small in size and weight," thus introducing two time-worn fallacies, namely, that depth is necessary in gold mining and that large bulk samples are required in ascertaining the average content of a lode. This episode illustrates the conditions most likely to bring mining companies to grief. Apparently the chairman is an admiral and the directors are at sea.

An Abandoned Project.

WE HAVE REASON to believe that the plans of the Guggenheims to build a big smelter close to San Francisco have miscarried. Work is being stopped at San Bruno. A large part of the machinery intended for this plant has been diverted to Ely and to other smelters controlled by the American Smelting & Refining Company. In their decision to drop the project it is probable that two factors were responsible; the first being the failure of the Dairy Farm mine in Placer county, California, from which a large supply of copper ore was expected. At 500 feet the orebody became lean and it is now quite evident that this mine cannot do what was expected of it. The other reason for stopping work at San Bruno was the strong protest and organized opposition of the citizens of San Mateo, who claimed that the sulphurous and arsenical fumes would kill vegetation and cattle. This was based largely on error and prejudice, assisted by a professor of chemistry who was an expert witness against the Anaconda Company; it seemed to us that the position of the smelter people was strong, for they were entitled to complete their plant and to prove that, with the sulphuric acid annex, they could mitigate any possible nuisance caused by obnoxious fumes. However, that problem will not be tested, it appears now, and the people of San Mateo will be able to buy the smelter site and erect upon it a chemical brewery, an oil refinery, a tannery, or some other sweetly smelling manufactory. Most of the grading, retaining walls, and foundations, besides railroad tracks, have been completed, so that the smelter company has done a good deal of work that will be useful to others. The episode is regrettable. A large smelter near San Francisco would have stimulated local industry and emphasized the importance of the City as a technical centre. In the opposition to the project, the Guggen-

heims suffered from their own exaggerated talk of the tonnage to be treated, 5,000 tons per day being mentioned at one time, although the plant was to begin with a capacity of 1,000 tons daily. This had the effect of warning possible competitors, such as Schwab and others, to keep off the field, but it excited the owners of villas and orchards at San Mateo and Burlingame. In the meanwhile the fiasco of the Dairy Farm mine was probably the most decisive factor and it goes to prove that smelters dependent on single mines are in a precarious condition unless ample precautions are taken to prove the ore reserves. The decisions in the smelter-smoke cases at Salt Lake were given after the San Bruno project had been started, as also the judgment obtained by the State of Georgia against the Tennessee smelters. These afford unpleasant precedents. In this matter the smelting companies have suffered from blackmailing and ignorance, as much as from their own doings, but back of it all is their carelessness and lack of consideration for the rest of the community. To put smelters in the middle of a distinctively agricultural region like that of the Salt Lake Valley was to invite trouble. There is plenty of desert land in the same State where fumes could injure only sagebrush and rabbits. For the San Bruno enterprise there was much better excuse; the projectors of it wanted to be at tide-water and near a large distributing centre. They chose a site least likely to interfere with others and they purposed to employ every known device to mitigate injury from the smoke. They have suffered from the reckless action of the smelter managers elsewhere. It is time for metallurgists to tackle this subject earnestly. All of us that are interested in the welfare of the mining industry appreciate the importance of the smelting department; if the smelters are driven out of business, the mines and miners will suffer. In the first place, we refuse to believe that the skill of the chemist and metallurgist is beaten, we expect to see the invention and application of devices perfectly able to prevent the destructive escape of noxious fumes. The manufacture of sulphuric acid is one of them; it can be used for making superphosphate, which is a valuable fertilizer, more marketable however on the Atlantic coast than here. Next, sites must be chosen where the ineffective smothering of smoke will not render the smelter liable to blackmail and persecution. It is argued that if a smelter makes a desert within a radius of 15 miles, the owners of such an establishment ought to buy a tract of desert land of equal dimensions and erect their plant there, where none will molest them and they will molest none. This is the last resort. Smelters need water and fuel, besides labor and supplies. These are more expensive in deserts than in fruitful valleys. That there is injustice on the part of the community and carelessness on the side of the smelter people, is proved by such exceptions as the Tacoma smelter, next door to a beautiful park, by the three Denver smelters, on the immediate outskirts of a large and handsome city, and by the five smelters at work in the thickly populated environs of New York. In all of these cases a little care on one side and a little

fairness on the other have obviated interference with one of the most useful forms of human enterprise.

Mint Purchases of Silver.

THE Director of the Mint has issued an order making a change in the regulations governing the receipt and payment for bullion, and it is interesting because these regulations have existed ever since the Government undertook to refine its purchases of gold and silver. The order reads: "From and after July 1, 1907, the deduction of $\frac{1}{100}$ of the standard weight of gold from silver contained in deposits at the mints and assay offices of the United States, will be discontinued. The depositor will be paid for the full weight of the silver contained in the deposit, based on the Assayer's report." This is an important matter to depositors of bullion. In the past it has been the custom to deduct from the silver contents an amount equal to $\frac{1}{100}$ of the standard weight of the gold in such deposits, that is, the depositor did not receive pay for that amount of silver. The justification for this deduction lay in the fact that it was impracticable to make a complete separation of the silver and gold in the refining operation, and that the amount of silver retained by the gold was equal to $\frac{1}{100}$ of the weight of the gold. Under the old process, of refining with nitric acid, this was true. Of course, a more complete separation of the metals could be obtained, but at such expense as to make it too costly and therefore impracticable, and this silver remaining with the gold was figured as part of the alloy in preparing the bullion for coinage operations. To illustrate; if it was found there were 10 parts of silver (out of a thousand) still remaining with the gold, then it was only necessary for the melter and refiner to add 90 parts of copper, whereas if the gold was pure he would be required to add 100 parts of copper. But about twenty-five years ago sulphuric acid replaced nitric in the process of refining; this was more economical, and therefore it became practicable to obtain a more thorough separation of the silver from the gold, according to the quality of the acid. The fineness of the gold obtained through this process varied from 990 to 997.5 per thousand, but no change was made in the manner of settling with the depositors. In the last few years the Government has been perfecting an electrolytic process of refining, which results in obtaining almost pure metal in either gold or silver at a still less cost than in the other process heretofore used, and therefore the Director of the Mint has apparently found that there was no further reason or justification in withholding from the depositor any part of his silver, it being all recovered, with a complete separation of the two metals. The experimental work of perfecting the electrolytic process has been done at the Philadelphia Mint, and after reaching satisfactory results, an electrolytic refinery was recently installed in the Denver Mint upon the completion of the new building there, and the new system is also being placed in the New York Assay Office. At the present time the work of installing the new process is going on in San Francisco, the last charge under the sulphuric acid process having been returned from the old refinery at this Mint last week.

Personal.

H. C. HOOVER is at Melbourne.

CHARLES MOLSON is at New York.

WILLIAM M. MEIN has returned to Johannesburg.

H. K. WHEELER, of Los Angeles, is examining mines in Arizona.

ALBERT BURCH is on his way to southern Chihuahua, Mexico.

JOSEPH C. HOPPER will remain in England until September.

T. E. SCHWARTZ has returned to Denver from southern Arizona.

PHILIP L. FOSTER is on his way from New York to London.

J. H. CURLE was here this week. He is now on his way to London.

JOSEPH L. GIROUX has returned to Los Angeles from New York.

JAMES W. NEILL has been to look at the copper mines of Yerington, Nevada.

T. B. BASSETT left Los Angeles on June 29 to examine mines in Sonora, Mexico.

CHARLES E. KNOX is general manager for the Montana-Tonopah Mining Company.

FRANK OLDFIELD was married at Pittsburg on June 22. He is now at Reno, Nevada.

R. J. FRECHEVILLE is examining the copper mines of Tanganyika, in central Africa.

W. J. PARKER, of New York, has gone to Cobalt, Ontario, to take charge of an important mine.

ROY W. MOORE is examining the Artemisa, near San Felipe, in the State of Sonora, Mexico.

V. G. HILLS, of Denver, has been examining tungsten properties in Boulder county, Colorado.

BRYCE TURNER is general manager for the Montgomery-Shoshone Mining Co. at Bullfrog, Nevada.

O. J. REYNOLDS has returned to San Francisco from the Santa Barbara district, in Chihuahua, Mexico.

H. P. GARTHWAITE, general manager of the Butters Salvador Mines Co., has arrived in San Francisco from Salvador.

FOSTER HEWETT, of Pittsburg, is on his way to examine the property of the American Vanadium Co., at Cerro de Pasco, in Peru.

FRANCIS J. PECK has purchased the property of the firm of Crowell & Peck, which has been dissolved. A new firm, Francis J. Peck & Co., will conduct the same business as formerly, with offices in the Williamson Bdg., Cleveland.

Dividends.

On July 5, the Bunker Hill & Sullivan Mining & Concentrating Co. will pay dividend No. 118 of \$180,000. This makes the amount of dividends paid since January 1, \$1,260,000, and total to date \$9,126,000.

Publications Received.

'Contributions to Economic Geology. 1906.' Part 1. Metals and Nonmetals, except Fuels. Bulletin 315. United States Geological Survey.

'The Juneau Gold Belt, Alaska.' By Arthur C. Spencer. Bulletin No. 287. Well illustrated. This most valuable report includes a description of the Alaska-Treadwell and other mines on Douglas island.

'Census of Manufactures,' 1905. Electrical Machinery, Apparatus, and Supplies. Bulletin No. 73, by Thomas C. Martin. Published by the Department of Commerce and Labor, Bureau of the Census, Washington.

Latest Market Reports.

LOCAL METAL PRICES—July 3.

Antimony.....	22.50@25.50c	Quicksilver (flask).....	538@39.50
Copper.....	25.75@26.75c	Spelter.....	7.75@8.50c
Pig Lead.....	5.85@6.80c	Tin.....	43.25@44.75c

MINING STOCK QUOTATIONS—NEW YORK.

	June 27.	Closing Prices July 3.
Bingham Central.....	13 $\frac{1}{4}$	13 $\frac{1}{4}$
Boston Copper.....	26 $\frac{3}{4}$	26 $\frac{3}{4}$
Cumberland Ely.....	7 $\frac{1}{4}$	8 $\frac{1}{4}$
Dolores.....	6 $\frac{1}{2}$	6 $\frac{1}{2}$
El Rayo.....	5 $\frac{1}{4}$	5 $\frac{1}{4}$
Guanajuato Con.....	3 $\frac{1}{4}$	3 $\frac{1}{4}$
Giroux Con.....	8	8
Greene Con.....	23	24
Nevada Con.....	13 $\frac{1}{4}$	14 $\frac{1}{4}$
Nipissing.....	11 $\frac{1}{2}$	10 $\frac{1}{2}$
Tennessee Copper.....	38	38 $\frac{1}{4}$
Tonopah Ex.....	14 $\frac{1}{4}$	17 $\frac{1}{2}$
Tonopah-Belmont.....	3 $\frac{1}{4}$	3 $\frac{1}{2}$
Tonopah.....	14 $\frac{1}{4}$	13 $\frac{1}{2}$
United Copper.....	62 $\frac{1}{4}$	61
Utah Copper.....	26 $\frac{1}{2}$	26 $\frac{1}{2}$

(By courtesy of Hayden, Stone & Co., 25 Broad St., New York.)

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.

Date	Electrolytic Copper	Lead	Spelter	Silver
June 28.....	22 $\frac{1}{2}$	5 $\frac{1}{4}$	6.37	67 $\frac{1}{4}$
" 29.....	22 $\frac{1}{2}$	5 $\frac{1}{4}$	6.37	67 $\frac{1}{4}$
" 30.....	Sunday. No market.			
July 1.....	22 $\frac{1}{2}$	5 $\frac{1}{4}$	6.32	67 $\frac{3}{4}$
" 2.....	22 $\frac{1}{2}$	5 $\frac{1}{4}$	6.30	67 $\frac{3}{4}$
" 3.....	22 $\frac{1}{2}$	5 $\frac{1}{4}$	6.30	67 $\frac{3}{4}$
" 4.....	Legal holiday. No market.			

COPPER SHARES—BOSTON.

Closing prices.		Closing prices.	
Name of company.	July 3.	Name of company.	July 3.
Adventure.....	2 $\frac{1}{2}$	Michigan.....	14
Ahmeek.....		Mohawk.....	84 $\frac{1}{2}$
Allouez.....		Nevada Con.....	14
Amalgamated.....	83 $\frac{1}{2}$	North Butte.....	84 $\frac{1}{2}$
Arcadian.....		Old Dominion.....	48 $\frac{1}{2}$
Atlantic.....	13 $\frac{1}{2}$	Osceola.....	
Balakiala.....		Parrot.....	
Bingham Con.....	15	Phoenix.....	
Boston Con.....	29	Quincy.....	119
Butte Coalition.....	26 $\frac{1}{4}$	Raven.....	1 $\frac{1}{2}$
Calumet & Arizona.....	169	Rhode Island.....	
Calumet & Hecla.....	820	Santa Fe.....	3 $\frac{1}{2}$
Centennial.....		Shannon.....	18
Con. Mercur.....		Superior & Pittsburg.....	15 $\frac{1}{2}$
Copper Range.....	83	Tamarack.....	
Daly-West.....	16	Trinity.....	
Franklin.....	15 $\frac{1}{2}$	United Copper com.....	
Granby.....		Utah Copper.....	52 $\frac{3}{4}$
Greene-Cananea, etc.....		Victoria.....	7 $\frac{1}{2}$
Isle Royal.....	21 $\frac{1}{2}$	Winona.....	
Mass.....	5 $\frac{1}{2}$	Wolverine.....	160

(By courtesy of E. F. Hutton & Co., 490 California St.)

A Big Pump.

The largest high-pressure pump in the world is said to be installed in the Dry Diggings placer district in southern Oregon, on Rogue river, and is used to operate a battery of hydraulic monitors. This pump is one of the largest pieces of mining machinery ever manufactured, and could never have been installed but for the fact that it was unloaded directly from the cars to the foundation prepared for it at the mines. The pump was built by the Byron Jackson Machine Works of San Francisco, and was one of the last big installations executed by this company before the earthquake-fire. It is of the five-step centrifugal type, and weighs, aside from bearings and gears, just 70,000 lb. Other pumps have been built that lift as great a volume of water, but they do not deliver it under such enormous pressure as this one. The pump is tested to withstand a maximum pressure of 250 lb. per square inch. It has a capacity of 13,000,000 gal. per 24 hours, or 9,000 gal. per min. This enormous volume is delivered through a half-mile of steel pipe, of 22 in. diam. The water is lifted to a height of 100 ft. and forced through two four-inch nozzles, hurling streams a distance of 500 ft. These powerful streams play upon a high bank of gold-bearing gravel.

General Mining News.

ALASKA.

During this summer the geological survey of Alaska is to be continued by 11 parties, several of which are already in the field. By further subdivision there will be 14 separate groups of explorers, comprising 20 technical men and 21 assistants. Five parties will study economic geology, five will make topographic maps in the Yukon-Tanana, one party will map the Kasaan peninsula, and two hydrographic parties will study the water resources of the most important placer districts. Fred H. Moffit assisted by A. G. Maddron, will examine the copper deposits of the Chitina river, a tributary to Copper river. Much development work is being done in this district.

A settlement has been reached by the mine operators and employees at Ellamar, and the Ellamar Mining Co. has granted the demands of the union for \$4 per day for miners, and has abolished the black list. There is a great demand for miners and laborers at Valdez and Knights Island, and 200 more men could go to work at once.—New discoveries of copper ore are being made on Knights Island, and 250 men are at work there.—At the Young group of claims on Chickagoff Island, two Hendy mills of two stamps of 850 lb. each, have been ordered, and a steam power-plant. A. M. Archangelsky is the superintendent.—Casey & Howard, who bonded the Golden claims from W. P. Mills & Co., are driving on the vein. More miners are needed.

Reports of the good strike at Unalaklik have been confirmed. Itokle, Mackle, Spencer, & Gaines made the discovery, after prospecting for two years through the McKinly range and down the Kuskokwim. They have sluiced out some big nuggets and some of the gravel runs 75c. per pan. The Innoko river is 500 miles long, and can be navigated to within 60 miles of the strike with light steamers.—A good deal of prospecting is going on in the Sinook region, on the Sinook, Boulder, Independence, and Willow creeks, and Cripple river. Good pay-ore has recently been uncovered on Cripple and Boukler rivers.

ARIZONA.

GRAHAM COUNTY.

(Special Correspondence).—The Arizona Copper Co., at Clifton, has just put into operation one of the finest gas-plants in the Southwest, and has just completed a large reservoir above town which will help to supply the concentrator and plant with water. The flume has been repaired and is handling the water satisfactorily. Other improvements are being made and the plant generally is in better shape than for some time past. Judging from the number of improvements already made and the many under consideration, there does not seem to be anything in the recent rumors that the works would soon be moved away from Clifton.—Work will be commenced next week on the new furnace and it will be ready for business not later than July 15.—F. H. Perry, superintendent at the New England & Clifton copper mines for the past four years, has resigned and will devote his time in the future to the development and management of the Laura D mine, on which he has a lease, and from which he has already made two shipments.—In the Standard mines good ore has been encountered and will soon be making a good showing. The best showing is in the shaft of the Copper Center mine, where a good body of high-grade sulphide ore has been opened. The tunnel from the standard being driven to tap the Copper Center property at depth, has reached a length of 1,000 ft., but up to the present the expected orebody has not been reached. Copper stain is showing in the face of the tunnel, and it is expected that the ore will soon be found. The tunnel has now reached the point where the orebody was expected, but it may be that the vein changed its dip and may require more prospecting to find it. Standard Consolidated stock has been low the past few years, but some sales have been made recently at \$3.

Phoenix, June 22.

Horace Moses is the new superintendent for the New England Copper Co., at Clifton, he having succeeded Mr. Perry, who resigned to operate the Laura D. mine.—I. N. Stevens, superintendent for the Chase Creek Copper Co., announces a strike in the tunnel that cross-cuts the country for 1,750 ft., reaching a depth of 900 ft. The portal is near the Coronado railroad.—A 40-man force is employed at the Gold Belt property, four miles from Morenci. Ore is being hauled, and a 100-burro pack-train will soon be carrying ore. In 15 months the company has done 473 ft. of shaft work, and 796 ft. of tunneling.

The Ash Peak company is not shipping at present, pending the erection of a mill. Arthur Murphy is the manager.—The Gold Belt D. & R. Co. has shipped another earload of ore to the Shannon smelter. The burro-train will soon be packing ore.—The directors of the Shannon company have declared another dividend of 50c. per share, payable July 1.

PIMA COUNTY.

(Special Correspondence).—The work on the Twin Butte mine, near Tucson, has been on the first or 165-ft. level.



Map of Arizona.

From this mine, 12,000 tons of ore have been shipped to El Paso, and it all came from this level. The second level has been opened and connected with the first, but no ore of consequence has been stoped, although there is plenty of it developed. Some time ago it was decided to stop shipping and continue sinking, and opening up the third level. This work is going ahead nicely, and the shipping of ore will be resumed at an early day. With the mine opened in this way, it is expected the working costs will be reduced. The building of a railroad from Tucson to the Twin Butte mine was completed about a year ago, but only recently was the work of surfacing and ballasting the track finished. About 75 men are employed in the mine.

Phoenix, June 20.

PINAL COUNTY.

(Special Correspondence).—In the Kelvin mining district, the London-Arizona mine is looking well. The orebody extends downward at an angle of about 15° and lies along the contact of limestone and quartzite. The tunnel is being run along the top of the quartzite and the raising system will be used in mining. It is a plan of the company to build a smelter on a mesa close to the Gila river, as soon as enough ore is blocked out to justify the expenditure. A gravity-train will be built down to the smelter site, making handling of ore from mine to smelter cheap.

Phoenix, June 29.

CALIFORNIA.

AMADOR COUNTY.

Several men are at work on the Hazard mine, between the Fremont and the Bunker Hill, under the supervision of L. R. Poundstone, who is employed by Lane & Hayward. The Little Amador will start work, also, and Amador City may be lively again. The Little Amador has not been worked for 25 years; the shaft is 800 ft. deep. There was a 40-stamp mill on this property, between the Keystone and the Bunker Hill, and it is understood that good ore was showing in the shaft when work was suspended.

SIESTA COUNTY.

The Delmar smelter will be rebuilt, and will have double the capacity of the old, and be arranged on a different plan. Both old furnaces have been torn down and the converter-room has been dismantled, and an extension will be put on the west end of the building. D. M. Riordan is the managing director for the Bully Hill company.

TUOLUMNE COUNTY.

The Reed gravel mine has been purchased by operators from Alaska.—The Zenora shaft is 112 ft. deep and the vein has widened from 4 to 20 in.—The Blue Lead mill is running, equipped with seven stamps and three vanners.—Some rich ore has been struck on the 170-ft. level of the Duffield.—Sinking at the North Star will be resumed this month. W. G. Phipps is the manager.—Work on the new 100-stamp mill for the Grizzly, Dead Horse, and New Albany properties is progressing rapidly. These mines have produced large amounts of gold.—About 20 men are employed at the Spring Gulch mine, and new equipment is being installed.—The Eagle-Shawmut company, which is operating an 80-stamp mill, is arranging to have a spur built from the Yosemite Short Line railroad to the mine.—Marble quarrying machinery is being installed at the quarry near Vallecito, and 100 men will soon be employed.

IDAHO.

SHOSHONE COUNTY.

(Special Correspondence).—Reports of a strike in the 850-ft. tunnel on the Orofino mine, six miles east of Murray, have come to Spokane. The vein was encountered a few days ago and proved to be nine feet wide. Two feet of the lode is shipping ore, which carries 35% lead and some silver. The rest of the vein is concentrating ore. The strike was made at a depth of 165 ft. There is some doubt as to whether it is the Orofino vein that has been cut, for, according to surveys, the vein should lie about 40 ft. ahead of the present breast of the tunnel. A drift will be run 100 ft. each way, and then a shaft will be sunk. The Orofino is the west extension of the Bear Top mine and is held under bond by Missoula men, represented by M. R. Rutherford. One payment has been made on the bond and others come due in October and April.—The Hecla Mining Co. has paid a dividend of 10c. per share, or a total of \$100,000 for June. This brings the Hecla's dividends for 1907 to \$280,000, and total dividends of \$1,280,000 to date.—The Hercules Mining Co. has paid its regular dividend in June of \$92,000, bringing the total this year up to \$572,000. The grand total to date, including the present dividend, is \$2,392,000.—W. D. Greenough, manager of the Snowstorm mine, near Mullan, says the company will soon increase its dividends. He says they are getting \$98,000 per month from the smelting company for ore shipped and are only giving out a dividend of \$45,000 per month. At present they have under way improvements to the amount of \$50,000 in bunk-houses and boarding houses. The orebodies are opening up in good shape and the Snowstorm mine will be one of the large copper properties of the country within the next two years. Shipments are 400 tons per day, but lack of labor is the only thing that is holding down the production to this figure. The company paid its regular monthly dividend of \$45,000 in June. This brings the dividends for this year to \$315,000. The company has maintained its rate of three cents per share for five consecutive months.—Work will begin soon on a concentrator for the Moon Gulch M. Co., in Moon gulch, in the Coeur d'Alene. The property consists of six claims. The lower tunnel on the property is in 480

ft. The capital was recently increased from 1,000,000 to 1,500,000 shares. A carload of ore has been shipped.—W. W. Wait and David Cross, of the Temple Mining Co., have made arrangements to finance the Rob Roy M. Co. in the Coeur d'Alene. At a meeting of the board of directors a few days ago, the resignation of McInnis, president of the company, was accepted, and these officers were named: President, Sam D. McDonald; vice-president and manager, J. N. Davis; treasurer, Hugh Toole. W. W. Wait has been elected secretary of the company in place of O. A. Olsen. The property consists of five claims in the Sunset Peak district, and development work has been carried on for 12 years. The property has been developed by two long tunnels and some shaft work. There is a well defined vein, and good ore has been exposed. The company is capitalized at \$1,500,000. Work is to be resumed at once under the management of J. N. Davis, and orders have been placed for ore-cars, tracks, supplies, and equipment.—W. Clayton Miller, of the Federal M. & S. Co. (of which Charles Sweeney, of Spokane, is president) states that within two years no mill in the Coeur d'Alene will be producing coarse tailing. The re-grinding machinery will be in operation at the Morning mill before the snow lies and from that time on the mill will discharge nothing but slime. Re-grinding machinery will be installed in all other mills of this company. The closer milling will not only increase the district's output, but it will be a material factor in solving the tailing problem.—Directors of the Reindeer Copper M. & M. Co., operating in the Coeur d'Alene, have resigned and a new board has been named. The new officers are H. A. Keough, president, and J. B. Wilcox, secretary and treasurer. The reason for the resignations is that it cost the company \$50 per foot to sink a shaft on the property, an expense it could not bear. The new board has levied an assessment of one cent per share to carry on development work, and it is now planned to run a lower tunnel of 4,000 ft. to tap the ore. This will cost \$50,000.—Directors of the Missoula Copper M. Co., which owns a group of claims on Snowstorm hill, near Mullan, will award contracts soon to drive an 1,800-ft. tunnel to tap at depth the two veins crossing the company's ground. The work will cost \$20,000.—Work has been started on the 100-ton concentrator at the Stewart mine, near Wardner. The Stewart has been shipping steadily the last two months, the ore being forwarded to the smelter at the rate of 20 tons daily.—The Federal M. & S. Co. paid its regular quarterly dividend of \$510,000, June 15. The common stock obtained \$300,000 and \$210,000 was divided among the holders of the preferred stock. This makes a total of \$1,020,000 disbursed this year and a total of \$5,650,000 to date.—S. P. Williamson has just returned from the Pittsburg group, on which he recently took a \$100,000 bond. Work is being done on the tunnel preliminary to employing a larger force of men. The group is one of the oldest locations in the Pine Creek district in Idaho. It was located by Gus Smith, of Wardner, and is owned by him. It adjoins the Nabob, and is believed to have the same vein. Ore has been found in the tunnel, which is in 200 feet.

Spokane, June 29.

WASHINGTON COUNTY.

Reports state that a rich strike has been made by the Belmont Mining Co., in the Heath district. This company was organized but a few months ago and the stock is owned by Weiser and Boise people. E. M. Heigho is president and Avery C. Moore is treasurer.

MONTANA.

FERGUS COUNTY.

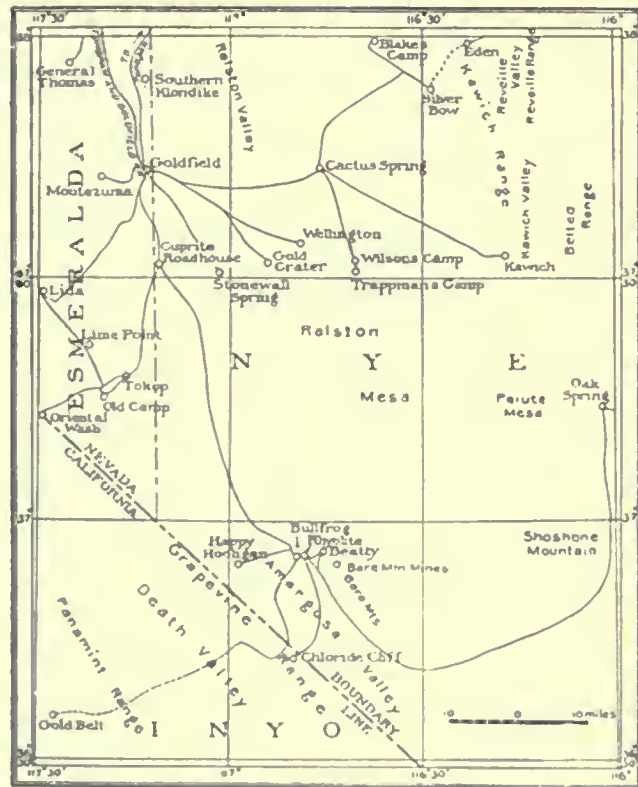
The Barnes King Development Co. is capitalized at \$2,000,000, divided into 400,000 shares par value \$5 each. The Barnes King property is in the Kendall district, which is the largest gold-producing district in Montana. The gold-bearing veins have been worked at different points for two miles in length on the veins. This property consists of 23 mining claims, composed of 200 acres of ground, equipped with a mill of 210 tons daily capacity. The mill has produced, since starting, more than \$1,700,000 in gold bullion

from Barnes King ore. The method of extraction is by cyanide, and is simple and cheap. The Development company bought the Barnes King property January 1, 1907, and immediately started development and equipment work on a new machine shop, new air-compressors, and a new shaft at the south end of the property. Part of the new machinery has already arrived at Lewistown. About 1,000 ft. per month of development, drifts, and tunnels have been run in the mine, and in doing this work a new vein parallel to the present workings has been discovered and opened up. This is the most important discovery of ore made in the history of the Kendall mining district, as the ore assays from \$10 to \$24 per ton in gold, and has been opened by drifts and cross-cuts, showing a body 25 ft. wide and 400 ft. long.

NEVADA.

LANDER COUNTY.

(Special Correspondence).—The Bullion Transportation Co. has been organized to carry freight and passengers from



Part of Nevada.

the Southern Pacific at Beowawe to Tenabo, 25 miles. Fifty men are engaged in the construction of a first-class road. This company now has at Beowawe a 60-h.p. traction engine for freight, and two automobiles. P. B. Locker is the president.—The telephone line from Beowawe has been completed and is now in operation.—The Nevada-Phoenix M. Co. has installed a 25-h.p. gasoline hoist and is down to the 200-ft. level, and is shipping two carloads of ore per week.—The Little Gem Mining Co. has a two-drill compressor in place. A pump has been installed, as water was encountered on the 300-ft. level. This mine has been a steady shipper for the last 10 months.—The Gold Quartz M. Co. has its new 15-h.p. hoist in operation, and is sinking the main shaft, which has reached the 200-ft. level, encountering at that point vein-matter in the granite. They are shipping from the 100 and 30-ft. levels ore running well in gold and silver. The Riggs lease on this property continues in ore, and is a steady shipper. Twelve tons of good ore is sacked and ready for shipment.—The Pocatello-Nevada M. Co., of which John Toombs is president, has reached 150 ft. in the shaft with a whim, and is cross-cutting to the vein. This company owns the Dexter, Pauline, Jack Rabbit, and Two Johns claims.—The Widows mine is one of the best of the smaller producers. A shaft is 100 ft. deep on the incline, following the vein. The ore from this property averages \$70 per ton. P. B. Locker

and T. Raleigh are interested in this company.—The Grand Victor, Great Western, and Vollante claims, adjacent to the Gold Quartz, were recently purchased by the Nevada Hills company. Machinery is being installed for development work.—The town of Tenabo is growing rapidly, and miners and carpenters are in demand.

Tenabo, June 28.

LYON COUNTY.

(Special Correspondence).—A strike is reported on the third level at the Ramsey-Comstock mine, the pay-shoot being on the hanging wall, where it is wider than on the second level. Picked samples ran \$500 per ton. There is not as much copper showing in the ore taken from the cross-cut as is found in the drift above, but more of it is showing as they drift north on the shoot. The conditions on both levels are almost identical and it is quite evident a few feet will uncover rich specimens of gray copper ore. When they drive about 35 ft. a raise will be run to the next level. The ore pans free gold, along with the rich sulphides.—Another high-grade find has been made at the Ramsey-Consolidated mine, locally known as Dago No. 2. The company is sinking the shaft outside the hanging wall and has encountered some ore. This one is about 3 ft. wide and contains gray copper, gold, and silver. Nearly 3 oz. gold, 7 oz. silver, and 3% copper, or \$58 per ton. Finding gray copper in this parallel vein calls attention to the strike, as this mine is on a belt separate from the Ramsey-Comstock, where the same character of ore was found.

Another strike was a cross vein encountered at the 150-ft. level. They have encountered water in the mine; the shaft is 270 ft. deep and will be continued another 30 ft. before cross-cutting is done.—At the Ramsey-Bonanza mine, ore has been struck in two places in a cross-cut being driven from the lower incline shaft to the vertical working shaft. The first strike is quartz, occurring near the hanging wall accompanied by a talc seam 18 or 20 in. thick. The second strike was made a few feet further on, in an ore carrying sulphides. They are now sinking again in the shaft and are down about 70 ft. from the surface, and will go 500 ft. deep.—At the old Garavanta mine they have encountered the hanging wall of the great dike, known as the Mother Lode, and have found ore of low grade, with some milling ore exposed, although at intervals are ore-shoots of shipping value. Near the hanging wall of the porphyry dike they have found a vein five feet wide that is richer than any so far encountered. The strike occurred at the end of the 650-ft. tunnel. Above this tunnel two more are driven, each over 400 ft. long, and showing ore. Farther up the ravine two incline shafts are sunk on either wall of another parallel vein. At this point a cross-cut was run 80 ft. toward the hanging wall, on the 120-ft. level. Water drove the workers out, but they are arranging to put a pump and hoist in and will soon be at work on this part of the property.

Ramsey, June 20.

NYE COUNTY.

At Manhattan, a little work is being done on the Seyler-Humphrey ground by lessees, but not by the company itself, as there are no funds and the treasury stock is exhausted. The company must raise more money in some way, and a scheme for reorganization is being planned. This was one of the typical Manhattan stock flotations, which sold shares at a good price during the boom, but now the inevitable slump has come.—The Manhattan Mining Co., operating the Annie Laurie claim, has recently suspended operations, owing to lack of funds. The Manhattan Homestake Co., also managed by Bond & Co., closed down several weeks ago.—It is reported that operations may be resumed on the Manhattan Buffalo, but the property is idle at present.

NEW MEXICO.

GRANT COUNTY.

Santa Fe engineers have surveyed a line for the proposed extension into the Burro Mtn. mining district. This line will be 14 miles long, and will leave the Silver City branch a short distance above Whitewater, running up a cañon to the Tyrone property and to the Burro Mountain company's mines, and serving the Comanche, Copper Gulf, and other properties in the neighborhood.

LINCOLN COUNTY.

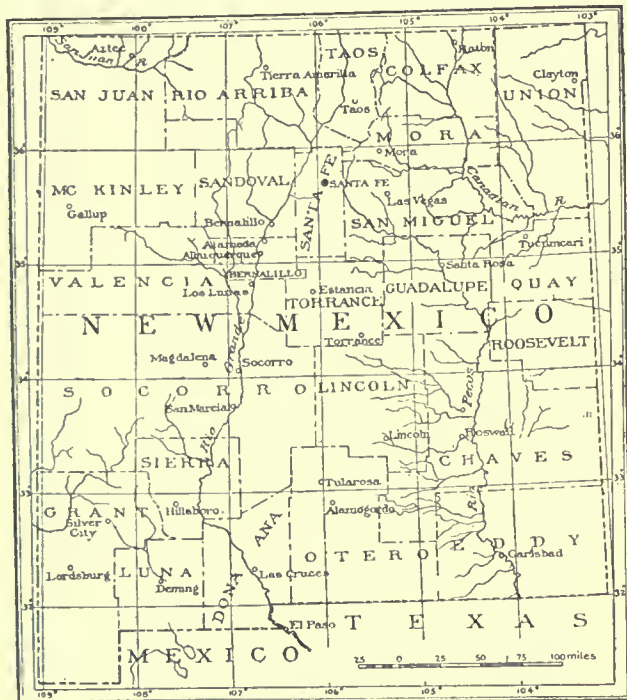
Three companies are working in the Red Cloud mining district, which was a producer of some gold, silver, and copper ore, 20 years ago. The principal companies are the Corona Queen, of which Thomas M. DuBois is superintendent; the Columbia Copper Co., of El Paso, with Martin Fishback in charge; and the Iron & Copper Co. of Denver, for which J. Morris Finn is the manager. Steam-boists, pumps, and other machinery has been ordered for all these properties. There are 200 men employed in the district.

OTERO COUNTY.

The Tularosa Copper Co., operating at Bent, is turning out concentrate from its 30-ton mill. Plans are being considered for a larger plant. The main shaft is down 75 ft., but stoping has been carried for 300 ft. each way on the vein. The company operates with water-power, supplemented by steam.

SAN MIGUEL COUNTY.

Development work on the copper mines of the Pecos Mining Co. has ceased for the present, and the miners have



Map of New Mexico.

been laid off. The company, for which O. W. Alexander is the superintendent, is considering the construction of a branch railroad from the mines to the Pecos switch on the Santa Fe railroad, 23 miles.

OREGON.

BAKER COUNTY.

L. V. Swiggett announces that a mill will be built on the Golden Chariot ground. It will consist of four batteries of three stamps each, of the Merrill make.—The dredge at the Crane Flat placers has been closed down by A. Burch, and no more work will be done at that point.—About 15 men are employed at the Bonanza mine, and development is progressing beyond the dike on the 200-ft. level.—The Daines M. & M. Co., operating the Belcher mine in the Greenhorn district, will build a mill this summer, and install machine-drills.

SOUTH DAKOTA.

CUSTER COUNTY.

(Special Correspondence).—The largest operating company here just at present is the Westinghouse Electric Co., and is working two mica mines, the New York and the White Spar, where 35 men are employed, besides the 50 operators that work at the mica factory at Custer. They are just now putting in an electric plant at the New York mine, with an engine of 250 h.p., weighing 16 tons. Joseph Pyne is in charge of this property.—One of the busiest camps

in the district just now is the Saginaw, where the company is driving from the 400-ft. level and at the same time erecting a mill of 100 tons capacity. They have a vein 12 ft. wide of \$10 ore and two other veins, one on each side, each about 7 ft. wide. They have not yet been reached in the drifts from the bottom of the shaft. The company has recently purchased the Philis and Solon groups of claims, which adds 160 acres to their holdings of 21 claims in the district. I. B. Herber is the manager and 25 men are employed.—On the Catawassa group, situated about nine miles northwest from Custer and near the Saginaw, Dan McGonigal and J. Hazlett are opening up a promising prospect. They are down 30 ft., and employ 10 men, running two shifts.—The Niagara is situated about 12 miles north of Custer. The company is sinking on a nine-foot vein of gold ore. About ten men are employed at this mine.—The Ivanhoe group of mines, eight miles east of Custer, with its five-stamp mill, is running steadily and the company is developing extensively.

Custer, June 25.

LAWRENCE COUNTY.

The incorporation of the North Homestake Mining Co. has been completed, with a capital of \$6,000,000, divided into shares of \$5 each. The company was organized under the laws of South Dakota, and has filed articles in Illinois so that it can have an office in Chicago. The organization took over the Penobscot group, formerly known as the Maitland mine. The officers are: Alexander Maitland, president; James Root, secretary and treasurer; A. J. Plowman, F. R. Baldwin, and E. W. Miller, directors. A wet-crushing cyanide plant with 40 stamps is in operation, the mill having been built several years ago by Cyrus W. McArthur, of Denver. The plant can treat about 150 tons per day, the ore averaging about \$7.65 per ton, with an extraction of about 72%. As the cost of mining and milling is reported as \$3.31 per ton, this would only leave a net profit of \$2.20 per ton, or \$100,000 for 300 working days, which would be only a fair profit on a capitalization of \$1,000,000, so it is apparent that some change must be made in the process or equipment before the capitalization of \$6,000,000 will be justified.—The fire in the Homestake has been extinguished, and the work of unwatering the workings has commenced. The mine had been allowed to fill to a point 75 ft. above the sill floor on the 300-ft. level, and the water above the 300 level is being drawn through valves placed in the bulkheads in the North End and Savage tunnels, whence it goes into Deadwood and Whitewood creeks. The skips will be started as soon as the water sinks to the 300-ft. level. The DeSmet mill is running with 100 stamps, and the Highland with 240 stamps, the ore being mined from the Star and DeSmet open-cuts. There are 200 miners at work and as soon as mining is started in the Terraville cut, the Monroe and Pocahontas mills will be started, adding 260 stamps to the 340 now dropping. The cyanide plants are working.

PENNINGTON COUNTY.

Machinery for the new electric hoist at the New York mica mine is being installed.—The Auburn mill, at Mystic, has started, and it is said that there are 3,000 tons of ore on the dump averaging \$7 per ton. The capacity of the mill is 75 tons per day.

TEXAS.

EL PASO COUNTY.

Seven of the eight furnaces of El Paso smelter are shut down as a result of a strike of 160 scale men, who walked out because they were not given the raise in pay demanded by them. The strikers are all Mexicans, who have been getting \$1.20 per day of 12 hours, and a premium of 20c. per day when working 25 days consecutively. The men have demanded a wage of \$1.50 flat, per day.

WASHINGTON.

CHELAN COUNTY.

(Special Correspondence).—On Chelan butte a vein nine feet wide has been intersected in a cross-cut, at a depth of 30 ft. There are other new discoveries on the butte. The Red Mountain mine, reputed to be one of the richest copper properties in the Cascade in eastern Washington, has

been visited by some of the directors of the company from New York, who have stated that a railway will be built 26 miles, from the mine to the Great Northern railway, and that the company will ship to the Tacoma smelter, until a smelter, now under construction by the company at Index, Snohomish county, is completed.

Republic, June 26.

FERRY COUNTY.

(Special Correspondence).—The Colville M. & S. Co., a New York corporation, has purchased three claims in Beleher district, named by the company the North Half group, and 42 claims in Park City Camp, known as the South Half group. An average sample from an iron-capped vein on this northern group assayed \$7.20 gold and 1.3 oz. silver per ton and 37.5% iron. Another vein was lately discovered, from which samples assayed well. An adit has been driven 260 ft. to cross-cut these veins, and the face is now in quartz, but has not reached the foot-wall. An Ingersoll-Rand Davis-Calix core-drilling outfit has been sent to the property, and a bore from the surface will be used to test the veins to a depth of 500 ft. On the South Half group 42 men are employed, and extensive operations have been planned. The county road up Gold creek has been improved, and a private wagon-road therefrom, 7,000 ft. in length, has been completed. A survey has been made for a water motor and electric power-plant and smelter site, and the company has contracted for three Ingersoll-Rand drills. From the Mountain Boy, one of the company's claims, the last carload of ore netted about \$1,100 over the freight and treatment charges, and three carloads are nearly ready for shipment on which the management expects to realize a net profit of \$1,000 per carload. Some low-grade ore will be treated by smelting in the two Medberg furnaces now in transit. From the north side of the hill an adit is being driven which intersected one vein at 110 ft. and another about 200 ft. from the portal. It is in 390 ft. and is expected to cut the vein on the south side at about 200 ft. further in. Six test pits have been sunk, and the vein has been stripped along the strike of the Summit vein for a distance of 120 ft. An average of 10 assays of the ore was \$1.60 in gold and 38.5 oz. silver per ton. The Summit vein varies from five to seven feet in width, and the filling is mostly quartz. An adit is being driven to cut it about 200 ft. deep. Another adit is being driven by this company to cut the Honest John, Alexander, Washington, and Blue Bird claims. Three cabins are under construction, the millsite is being cleared, and 4,600 ft. of flume is being built, to take water from Gold creek to the smelting and electric works. G. Weaver Loper is the general manager.

The Oversight M. & M. Co. has reported success in using a dip-needle for the discovery of ore deposits under the debris which covers the several veins on the Oversight group of claims. By this means a vein of iron sulphide ore has been discovered on the Granite claim, west of the No. 3 Oversight adit. The ore has a little quartz gangue. The vein has been traced for 140 ft. and found in three places, where it was covered only three or four feet with debris.

Republic, June 26.

OKANOGAN COUNTY.

(Special Correspondence).—The Oroville Consolidated Mines is a company recently incorporated, with \$2,000,000 capital stock, to develop property on the Okanogan and Similkameen rivers and Kruger Mtn. The trustees are W. C. Hancock, E. W. McCammon, Riley Coyle, A. Signs, and W. S. Schlensker.—The Grant Consolidated Mining Co., at Chesaw, has 25 men employed under A. D. McPhee. The last returns of ore shipped to the Granby smelter, at Grand Forks, B. C., approximated \$1 gold per ton and 6% copper. A new adit, to be run 1,500 ft., is expected to cut three different veins at depths of 300 to 500 ft. It is hoped to have 200 ft. of it driven this month.—The Standard mine, in Meyers Creek district, is being put in shape to ship ore, of which there is a good showing in the upper workings. The principal value is in copper. The company is figuring on a new adit about 1,200 ft. long, and in the meantime will drive the present lowest adit about 250 ft. farther to cut the vein.—The Crescent group of claims, in the

Twist district, has been bonded to Spokane people, who are obligated to work them continuously during the life of the bond, which calls for \$50,000.

Republic, June 24.

SPOKANE COUNTY.

Moran prairie, five miles south of Spokane, may develop the only real tin mine in the United States. Arthur J. Collier, an expert in the employ of Government geological survey, is now in Spokane and has spent several days looking over the property of the Spokane Tin Mines Co. He was reticent regarding the results of his investigation of the mine, but estimated that it is promising. He said the country about Moran prairie possessed geological formations such as would be found in a tin-producing country. The fact that there is granite in the land is rather favorable and an indication that the property is at least a good prospect.

STEVENS COUNTY.

Under the superintendence of L. Larsen, the Trojan M. & M. Co. has resumed work on its property on Toulon Mtn. After striking ore in an adit, 180 ft. below the cropping, a winze was sunk, but water drove out the miners and work was suspended. The company is driving an adit, expecting to encounter the vein at a depth of about 50 ft. and 800 ft. from the portal. It is expected to cut two other veins.—The First Thought Mining Co. is now shipping ore having a gross value of about \$40 per ton, chiefly in gold. There is sufficient ore reported as developed to maintain a monthly production of 5,000 tons for five years. At 500 ft. from the portal of the main adit a station 80 ft. square was excavated, and a 60-h.p. gasoline engine was installed. At 170 ft. below the adit a cross-cut has intersected 27 ft. of ore. An aerial tramway, driven by a 20-h.p. engine, was constructed at an approximate cost of \$30,000 and conveys the ore from the adit, two miles to the Washington & Great Northern railway, for shipment to the Granby smelter. The tram is capable of handling 250 tons per day.—The Sunset mine, near Northport, is producing ore which assays about \$100 per ton in gold, silver, and antimony. The shaft is down 210 ft. and will be sunk 100 ft. deeper. It is equipped with a hoisting and compressor-plant.—At the Mammoth and Morning mines, in the Metalline district, a joint adit is being driven between the two properties which has cut a 24-ft. quartz vein, rich in galena. It will be driven another 100 ft., to another vein, which crops out further up the hill. On the first vein the adit gives a depth of about 150 ft., and on it a winze will be sunk.

Republic, June 27.

MEXICO.

SINALOA.

The San Miguel Mining & Reduction Co. has been incorporated by a number of Denver railroad men and it is their intention to operate in the Santa Lucía mining district in the State of Sinaloa, where they have secured a large tract of land. Hugh Swearingen and Frederick Matthews are at the head of the concern.

SONORA.

At Cananea, spontaneous combustion in a planing mill started a fire that destroyed the assay-office, machine-shop, and a portion of the supply department of the Cananea Copper Mining Co. The smelter was uninjured, and the loss of \$150,000 is covered by insurance.

Reports state that within the last few days ore has been opened in shaft No. 7 of the Cananea-Bisbee company. At the 250-ft. level, the east drift has encountered good ore.

NICARAGUA.

The new Nicaraguan mining code seems to meet the approval of all interested; by its terms miners are allowed to import everything required for the mines free of duty. Almost the entire mountain country is virgin land open to location, and, while one Pittsburgh company has a mineral grant covering almost the entire district, they now grant prospectors terms which are almost as favorable as could be obtained from the Government.—No known coal or oil exists in the district, but the multitude of small streams, with falls and rapids, makes possible the use of hydroelectric plants for power purposes.

Special Correspondence.

London.

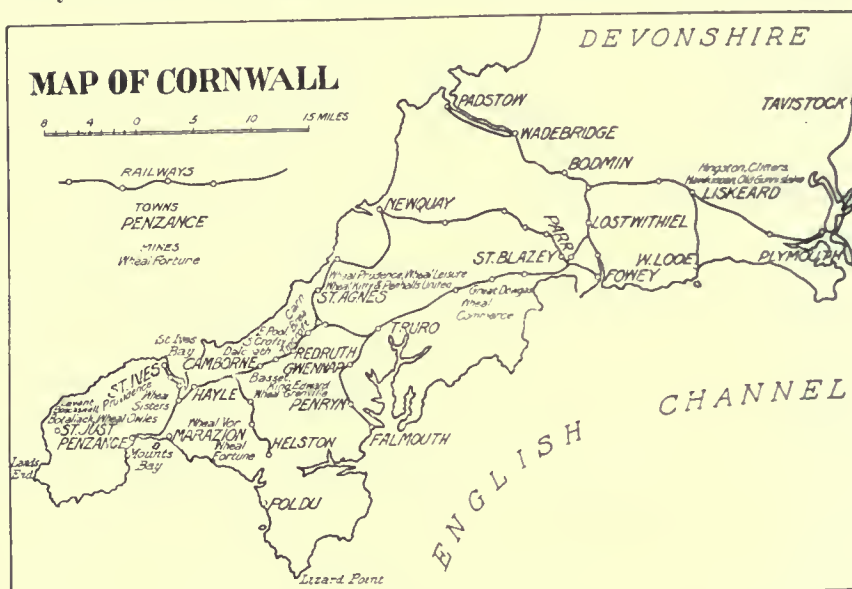
**Cornish Tin Ticketing.—Style of Reports.—Reopening of Old Mines.—
Comparison with the Rand.—Rhodesian Gold Production.**

The last Cornish black tin 'ticketing' showed a welcome increase over the previous fortnightly sale to the extent of some 40 tons in quantity and £4,000 odd in value. The total (244½ tons) realized £28,869, an average of £118 per ton. The chief sellers were: Dolcoath, 70 tons; Basset, 30; Carn Brea, 29; Grenville, 27; East Pool, 24; West Kitty, 14; Levant, 12½; Clitters 9 tons, and four of the resuscitated mines including Botallack and South Crofty made a brave show, with a few tons each as a beginning. The sale at Redruth attracted several strangers, among whom were Capt. Richard Cowling, for many years the manager of the Hamley and Yelta mines, Mr. Richard Eustice, chief engineer and surface manager of the Moonta mines in South Australia. These gentlemen had been absent from Cornwall nearly 40 years. As if to illustrate your correspondent's remarks on the subject of mine reporting, 'A Somerset man,' writing to a London journal asks, "Does the Cornish revival continue? We seem to hear very little about it. Are the new mines meeting with any success? What is the state of their developments? I suggest that they should issue short monthly reports. We do not want long ones with elaborate details, which no one reads, and few people understand if they do read, but we want a synopsis of what is being done and what is likely to be the result. I take a

great interest in Cornish affairs, but must say I am not well informed as to what is going on for the simple reason that official news does not seem to be forthcoming." Evidently the gentleman in question does not read the mining papers or he would have discovered that some, at least, of the Cornish mines are not backward in giving an account of themselves. Here is a specimen from South Crofty. "Report for four weeks ended June 8: Robinson's shaft—The pumps are completed to the 60 fathoms balance box station. Bickford's shaft—Recent developments near Bickford's have been important. It is probable we start equipment of this shaft at an early date. New Cook's Kitchen shaft, 18 by 6 ft. within timber, is 75 ft. below collar. Seven stopes are being worked by 46 men on day shift. Footage for the month, 255 ft. We have commenced to take out the Cornish stamps. The 20 Californian stamps crushed 1,378 tons for 22 tons tin and wolfram. Average recovery, 35.76 lb. per ton. We expect to have 40 heads working in July. Buss tables and Luhrig classifiers are working satisfactorily. Tin sold, £1,444; arsenic sold, £977. Recovery of arsenic per ton of ore was 12 s. 4 d. Wolfram—tenders for approximately 10 tons (60 to 70% tungstic acid) will be received on Monday, June 10." Another report states that the Californian battery is doing most excellent service. Over three tons per head are being crushed, and when the rock-breaker is at work the mill will render still better service. Those who have not fully appreciated the potentialities of Crofty are wondering where the tin-stuff is to be obtained to satisfy the

hungry maw of a mill of 40 heads. The bulk of the ore up to now has come from development, but over 2,000 ft. are now available for stoping, and some 50 men are engaged on this work. The Buss tables—six of them—are now in service and are giving good results.

An interesting function has recently taken place in the cutting of the first sod of a new shaft to re-start the Rodney mine at Goldsithney, in West Cornwall, a property well known to older residents of Goldsithney and district, and some of them are ready to say that it will become the best mine in the County. The work is being taken in hand by the Cornish Tin Syndicate. One of the speakers on the occasion of the ceremony said they were commemorating that event upon the day in which the greatest gamble in England took place—Derby Day—and he trusted that Rodney would prove a good horse to those who had backed it. The manager, Capt. Sam Williams, informed the company that he had known the property over thirty years. It had four lodes, which all joined to the east of the property, going right through to the west,



and they were from 3 to 20 ft. wide, and averaged about 40 lb. per ton. There were five working shafts on the property. Another old property to be re-opened is the Basset & Grylls, in the Wendron district, for which a company has been registered as Basset & Grylls with a capital of £12,000, in £1 shares. The first directors are Messrs. C. V. Thomas, O. Wethered, G. B. Pearce (all connected with Dolcoath), and W. J. Payne.

In an able article on the labor question the *Cornish Post* points out that there is no comparison between the condition of the Transvaal gold mines and the Cornish mines. In the first place, before one of the deep Transvaal mines reaches the producing stage a million pounds sterling has to be spent. The size and value of the reef is known. Arrangements are made for handling enormous tonnage. In Cornwall the lodes frequently vary in size and quality, and there are many lodes and many surprise packets in store for shareholders. Also no one subscribes a million capital and waits four or five years for returns from a single Cornish mine. Then again, the Transvaal mines are practically dry, whereas Cornish mines are so wet that each mine spends a fortune in pumping charges. No comparison can be made between Rand tube-mills, and cyanide process, and the stamps, vanners, tables, and frames used in dressing Cornish tin. Not only so, but one Cornish mine cannot even be compared with another, because a dozen factors may be different even in two neighboring mines. The one may have complex, the other free-milling ores; the one may have a larger area for its dressing plant than the other; the one may have

ample capital, the other may be slowly getting out of a tangle due to a shortage of capital or a score of other difficulties in times past.

According to a Reuter cable, on June 14, in the Transvaal Parliament, Gen. Botha confirmed the statement that the Chinese would be sent home on the expiry of their contracts. The Government was actuated by the fact that the native labor supply had for some time exceeded the demand. Repatriation is to proceed as the indentures expire to the number of about 16,000 before the end of the present year. This announcement had a depressing influence on the Kaafir market.

The Rhodesian gold output for May is returned at 52,668 oz., which is 2,541 oz. above the previous record established in August 1906. This makes the aggregate for the first five months of the year 236,857 oz., an increase of 22,344 over that for the corresponding period of last year. The other minerals produced during May comprised 12,730 oz. silver, 66 tons of lead, 10,118 tons of coal, 7 tons of copper, and 56 tons of chrome ore, while from the Broken Hill mine, in Northwestern Rhodesia, 250 tons of ore, assaying 55% zinc, were produced.

Johannesburg, Transvaal.

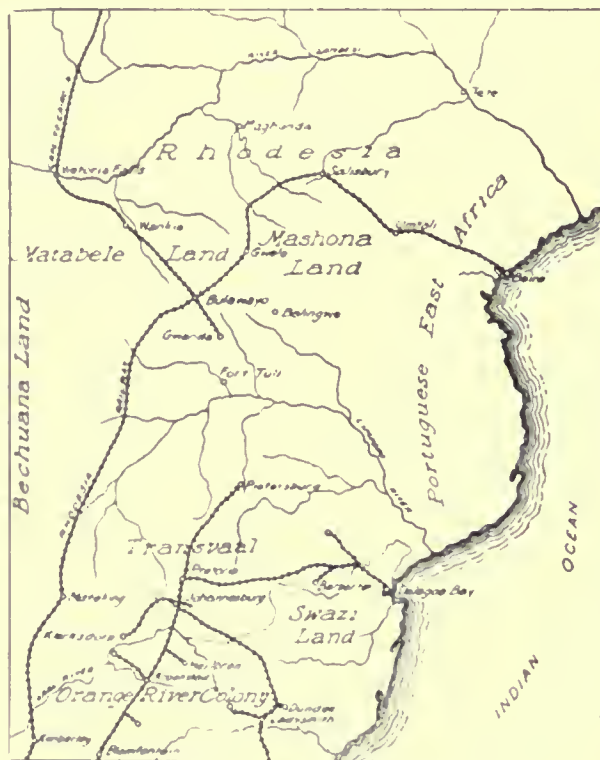
A Big Strike.—Riot and Disorder Soon Stopped.—Enforcement of Law.—The Engine-Drivers Uncertain.—An Opportunity for the Afrikanders.

It has come at last. No one ever expected to witness a strike of such magnitude on the Rand, but here we are in the midst of the greatest industrial upheaval ever known in South Africa. To the men who have gone out the results will be rather disastrous, from the wage point of view, but to the mining industry the strike will prove a blessing in disguise. With the exception of the mines controlled by J. B. Robinson, there is now a general strike along the Witwatersrand, in response to the orders of the Transvaal Miners' Association, ordering all underground men to leave their work. Why J. B. Robinson's crowd is exempt is not definitely known, but the general opinion is that he bought peace by donating £10,000 to the strike funds. The Government has acted with surprising promptitude and wisdom. The strikers raised hell on two mines, the Robinson and Robinson Deep, for a day, when several heads were hit, and some property damaged. After this, the Riot Act of 1894, which forbids an assembly of more than six persons within 300 yards of any mine shaft, mine building, etc., was promulgated, and Imperial troops were dispatched from Pretoria to see that law and order was maintained. Had not the Government acted with such firmness, and had the strikers continued to think that the supposed sympathy of the Government would have allowed them any latitude, there is no doubt that ere this many lives would have been lost and much property destroyed.

Seldom, if ever, has a strike of such magnitude been carried on, with so little bloodshed, or destruction of property. Had the same thing occurred in any place in America, especially in the Western States, long before this there would have been many disgraceful and brutal acts. Would that the same reign of law and order existed in the mining regions of the United States as one finds in the places where the Union Jack flies. There can be no doubt that in the British dominions there is much less chance for riot and anarchy during a strike than we find in the Great Republic. Why this comparative law and order on the Rand? Firstly, because the citizens of this place, both strikers and non-strikers, have been brought up to a wholesome regard for the law. Then again the military and police forces have been

used promptly, without any regard to the political consequences. How often in America has the party in power refused to use the strong arm of the law for fear of losing the votes of strikers later on!

The hoisting-engine drivers on the Rand are the most important factor in the present dispute. They have a strong well organized association and desperate efforts are being made by the Miners' Association to induce them to join the strike. So far the drivers have refused. A ballot is to be taken this week, however, and every one is awaiting the result with the keenest interest. As it requires two-thirds of the membership of the Engine-Drivers' Association to declare for a strike, the chances are against it. Should they come out, it will be a serious blow to the mines, for there is a limited supply of engine-drivers, who must be certificated by law, before they can haul men. No matter what happens, however, the mining houses are determined to see the strike to a



Map of the African Goldfields.

successful issue, even if it means shutting down many mills. The managers feel very sore over the strike, for they maintain that the underground men had absolutely no cause for the action they have taken. If the engine-drivers remain loyal to the companies, the strikers will undoubtedly lose the day. When they return to work they will come back on quite different terms. The days of the huge salaries for men who simply superintend labor are over, and we shall not hear again of miners earning from £75 to £100 per month. Day's pay will be the order of the day, and more shift-bosses will be put on to see that the day's pay is really earned. Hand stopers will earn from 16s. 8d. to 18s. 4d. per shift, and machine stopers from 20s. to 25s. per shift.

The present is a great opportunity for the Afrikanders, and they fully realize it. In the past the miners have tried to keep the underground work more or less to themselves, so that today the percentage of white men working in the mines, born and raised in this country, is rather small. This will be changed now. Boers from the farms are gradually coming in to the mines for work. Of course, they know little about mining, but as they are strong healthy men, amenable to discipline, they are good material to start with, and will in time make good

miners. To break these raw recruits in will require some time, and possibly some stamps will be hung up for awhile, but the general feeling is that it is better to suffer a bit just now, and teach the mining work to a class of men that will always live in the country, and who are not always grumbling.

Butte, Montana.

Assessments for Exploratory Work.—The Colusa-Leonard Extension Co.—Reins Copper Co.—Discovery in the Greenleaf.—Deepest Shafts.—Teamsters Strike.—Talk of Another Smelter.

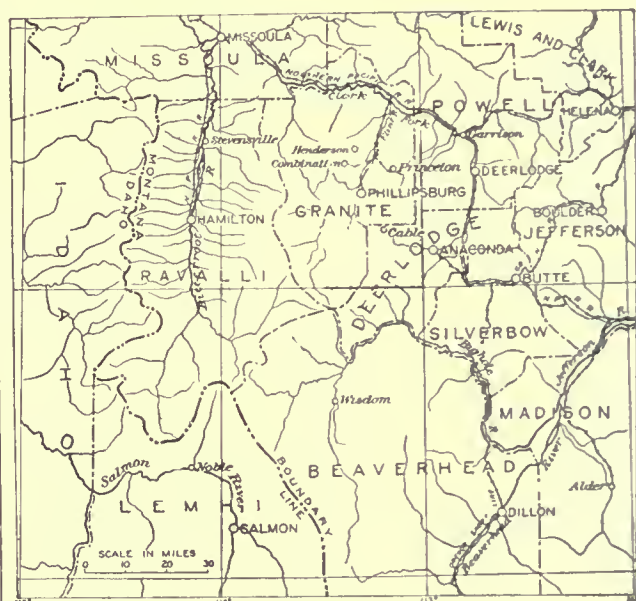
It seems likely that a number of the new mining companies operating in the Butte district will follow the example of the Amazon-Butte Mining Co. and make their stock assessable in order to raise money with which to continue development work. The Amazon-Butte assessment of five cents per share was promptly paid, stockholders preferring to pay it rather than permit treasury stock to be sold at the present low condition of the market. The Park Copper Co. has sent a circular to its stockholders asking for written permission to make the stock of that company assessable, the consent of three-fourths of the stockholders being required under the law. This company proposes an assessment of 2½c. per share, to create a fund of about \$15,000, which, the directors believe, will be sufficient to carry the development work to completion. An effort was made to pool the outstanding stock of the Park company, but less than one-tenth of the stockholders responded to the appeal. It is frankly stated in the circular that unless the stock is made assessable it will be necessary to stop work, and that would mean the death of the enterprise. It is hoped that by the time the first assessment is spent the mine will be able to pay its way, as some ore has been found in the vein so far explored.

The Colusa-Leonard Extension Co. is having trouble in handling the water in its shaft, as the old shaft of the Sinbad, a short distance east of the Colusa-Leonard, is draining the latter. The Sinbad is about 500 ft. deep and was filled with water. The Colusa-Leonard is now something over 720 ft. deep. The company's pumping capacity is taxed and additional pumping machinery has been ordered. It also is the intention to get new hoisting machinery, as the engine is not of sufficient capacity to sink to the depth of 1,500 ft. as contemplated. —The Reins Copper Co. is now making regular shipments of copper ore from the Combination mine. The ore comes from the 900 and 1,000-ft. levels and averages about 6% copper. The physical condition of the mine has been gradually improving.

The strike of a small vein of rich copper ore in the Greenleaf mine by the Boston & Montana Co. has raised the spirits of the men that are developing properties on the east side of the Butte district. The Greenleaf is situated only a few hundred feet south of the Six O'Clock mine, which was abandoned by the Butte Exploration Co. because pay-ore was not found in the first cross-cut. The vein was cut in the Greenleaf shaft at a depth of 840 ft., and from a little seam it widened in about 10 ft. to a thickness of 14 in., carrying bornite and peacock ore, assaying as high as 30% copper. It is considered an important strike, as it seems to demonstrate that the ground to the east of the Butte hill offers the same chances as the hill itself, and that the Butte Exploration quit too soon. The Greenleaf belongs to the Boston & Montana Co., an Amalgamated subsidiary, and according to the superintendent the vein strikes northwest and southeast, which will carry it through a corner of the Butte Exploration ground and directly through the centre of the

ground of the Butte & London. This company is sinking a deep shaft on the Greendale claim, situated a little west and north of the Greenleaf. Specimens of the rich ore have been on exhibition in different brokers' offices in Butte. George T. McGee, who had been in charge of the operations of the Butte Exploration, says there has never been any doubt in his mind that the company would have found commercial ore if it had sunk the shaft a few hundred feet deeper. The Greenleaf shaft will be sunk to a depth of 1,500 ft. before any exploratory work is done, and the Butte & London, which is now 1,025 ft. deep, will be taken to the same depth before cross-cutting is commenced.

The deepest mining shaft in the Butte district is that of the High Ore mine of the Anaconda Co., which is about 2,850 ft. deep. It will be sunk 75 ft. further and then work will be stopped and a station cut at the 2,850, from which point the levels will be run. The deepest mining is being done on the 2,400-ft. level of the Anaconda mine. The shaft of that mine is below the 2,500 ft. point. The company is also sinking on the St. Lawrence and doing development work in the Never Sweat. The



Montana.

J. I. C. and Gallatin shafts of the Anaconda Co., situated near the East Butte Co. mines, have been closed for a month on account of a strike of teamsters, the Gallatin and J. I. C. not being situated on a railroad. The two shafts had been yielding about 250 tons of ore per day. During the strike it developed that some of the local officials of big mining companies were interested in the ore-hauling business as an independent enterprise, controlling nearly all of the big teaming outfits, and in order to whip the strikers into line the Washoe and Clark smelters refused to receive any ore hauled by teamsters that had been granted an increase of wages by the small lessees and operators until the strikers should make a settlement with the big teaming outfits. The result was that a large number of lessees had to suspend work in all parts of the district.

Several Utah capitalists were in Butte last week to figure on building a smelter. They interviewed the officials of a number of the small mining companies and got estimates of the ore that could be furnished, and afterward opened negotiations with the officials of the Pittsburgh & Montana Co. with a view to leasing or purchasing the smelter building erected for the Baggageley experiments. It was said that if the parties could get that plant they would equip it with modern machinery

and methods. It seems to be the impression among persons familiar with the affairs of the Pittsburgh & Montana that it is not probable that the building can be secured by outside persons. The need of a new smelter in Butte is becoming so urgent that it is a question of only a short time until one will have to be provided to handle the ore produced by the new mining companies, the present works being entirely inadequate to handle even the present output of the district.

Denver, Colorado.

Freight Rates From Cripple Creek.—The Drainage Adit.—Progress in Various Districts.—Telluride, Silverton, Breckenridge, and Idaho Springs.

The shipping of the low-grade ores of Cripple Creek to the mills at Colorado City and vicinity, has received a decided stimulus from the new freight tariff of 75 cents per ton on ore running \$8 per ton and under. This is a reduction of 25% from the former charges. At the same time the rate on ore above \$40 per ton has been increased. This is of little moment, as it is understood that the mills and the smelters have a working agreement, under the terms of which the mills are not to contract for ore valued above \$40 per ton. At the same time a switching charge of 20c. per ton has been put into effect on all the ore that is handled by the samplers. This has aroused the wrath of the sampling companies, and the Taylor & Brunton Co. has secured an injunction to prevent the collection of the charge until its legality can be tested.

The driving of the deep drainage adit at Cripple Creek has received a decided check. The contractors had engaged to drive it at the rate of 300 ft. per month. After driving for five days, in which time they only advanced eighteen feet, they threw up the contract. The tunnel company immediately resumed work, and will carry it forward until another contract is made. The intention now is to sink a shaft about midway and advance the heading in each direction from this, as well as advancing the main heading. The failure of the contractors to live up to their agreement, which is ascribed to inexperience, is unfortunate, for it will make it difficult to obtain satisfactory tenders for completing the adit.

From throughout the State come reports of satisfying progress. At Telluride, the raise from the Stillwell tunnel has broken through into the upper workings of the Liberty Bell. With this event will come a change in the method of operating the mine. The ore broken in the upper workings will be let down by a counter-balanced skip to the tunnel level, and trammed to the entrance. At Rico, the motive power in the Group concentrator has been changed from steam to electricity, and the mill will soon be started. At Silverton, the tramway of the Detroit and Colorado mine is being pushed with all speed, and is expected to be completed by the middle of July. Meanwhile, the company is shipping about five cars of ore per week to the Ross smelter at Silverton. At Breckenridge, everyone is elated over the possibility of the Colorado & Southern building a branch road up the Snake river and another up French gulch. The Colorado Gold Dredging Co. has been exploring the Swan valley with churn-drills, and is about to begin the construction of two dredges. At Ouray the Mineral Farm mill will start up on the first of July. In the Daniel Bonanza a large body of rich lead ore is reported. At Lake City, the old Isalde group, which has produced some rich ore in the past, has been bonded to Silverton people, who hope to make it a productive mine once more. At Idaho Springs, a large orebody has been cut in sinking a winze in the Cardigan mine. The Stanley group of mines is also to be improved and

developed. The Scotia company at Silver Plume has driven through the dike on their property, and has been rewarded by finding an excellent orebody on the other side. At Central City, the heavy flow of water has caused several small properties to close down and at the Old Town mine an additional steam pump is being installed, as the electric pump is barely holding its own.

Mexico.

Chihuahua as a Smelting Centre.—New Plants and Old Mines.—The Mexican Mines Syndicate.—Activity at Concheto.

The conditions for the making of Chihuahua one of the most important mining, and possibly smelting, centres of the Republic are constantly improving. At almost the outskirts of the town is the famous old camp of Santa Eulalia, from which now the daily production is over 500 tons, being principally from the Chihuahua Mining Co., the Santa Eulalia Exploration Co., both shipping to the American Smelting & Refining Co. at El Paso, the Santo Domingo and Mina Vieja, leased to the A. S. & R. Co., and the San Toy Mining Co., of Charles M. Schwab and associates, which has just contracted for its product with the Torreon Metallurgical Co. At Minillas the Mexican Mines Syndicate, controlled by Donald R. Morgan and associates, of Monterrey, is opening up a number of old and almost abandoned properties, and is making an excellent showing by reason of having adopted up-to-date methods. This company has put a 100-ton concentrating plant on the Cobrizas property, which it is working under lease. By having an organized transportation service, and by using its own wagons, animals, etc., the syndicate is assured of the prompt movement of its own ores, besides making a nice profit on the carriage of all kinds of goods for others, and of its own supplies on the return haul. West from Chihuahua there is the wonderfully mineralized territory that is being opened up by the Chihuahua & Pacific Railroad to Miñaca, and beyond Miñaca by the Kansas City, Mexico & Orient Railroad. One of the richest mines in this part is the property of the Dolores Mines Co., near San Isidro station, in the Guerrero district, which has contracted for the high-grade ore with the A. S. & R. Co., but is largely independent by reason of its mill, from which the last shipment of bullion, just received in Chihuahua, and consisting of 56 bars, is valued at something over 100,000 pesos, and the property is supposed to be cleaning up about 30,000 pesos per month profit. But undoubtedly at present the centre of operations in that western region is the camp of the Greene Gold-Silver Co. at Concheto, a district which is variously spoken of, however, as the Jesus Maria, Ocampo, or Pinos Altos. In the latter part of last year the Greene Gold-Silver Co. bought the mines and mill of the Concheto Mining Co. for \$1,500,000, together with a large stock of supplies, which brought the amount paid up very close to \$1,600,000; and since that purchase the company has completed its Sierra Madre & Pacific Railroad from Madera to Temosachic, and a line wagon-road from Temosachic to Concheto (with the intention of continuing on to Mulatos in Sonora), besides having acquired additional property, the most important of which is the Navidad. Close to 800 men are now in the company's employ; daily trains run from Madera to Temosachic, and from there daily stages (pulled by the company's animals), to Concheto, making the 85 miles in 18 hours. The company's offices have been moved to Concheto. The Greene people have also organized the Sierra Madre Land & Lumber Co. to develop the immense timber tracts purchased in the Sierra Madre, and they have also acquired the El Paso, Sierra Madre & Pacific Railroad,

which it is intended to continue from its present terminus to Concheño or the Jesus Maria district, and so obtain direct connection with El Paso. And at Ocampo the Watterson Gold Mining Co. is installing a 100-ton cyanide plant. And at Santa Barbara, west from Miñaca, the Silver River (Rio de Plata) Mining Co., under the management of D. W. Shanks, has had its amalgamation mill running for a month on a remarkable body of ore averaging close to 100 oz. silver per ton.

The Nuevo Rosario Mining Co. has been organized as a holding concern for the Rosario Mining Co. for the purpose of operating the Condesa, Zuloaga, Rosario, and Providencia mines, in the Bolanos district, of Jalisco. Dr. J. H. Spence has been appointed general manager and has taken active charge. These mines are known as *antiguas*, and the old records show that at one time in their history they were great producers of rich ore. The workings are extensive. The first work of the new company will be to start an adit on the Zuloaga. It will be 2,000 ft. long and is expected to cut the vein at a depth of



Sketch Map Showing Position of Joplin.

1,100 ft., which is well below the old workings. The company is composed of Americans, headed by George J. Atkins of Lancaster, Pa. Among the improvements planned is a new concentrating plant.

The Santa Barbara silver mine, situated at Guzapares, in Chihuahua, has been placed upon a paying basis by the erection of a new mill by the Compania Minera de Rio de Plata, which owns it. The manager is Clarence C. Chase.—The new 120-ton mill of the Peregrina mining Co. at Guanajuato is now in successful operation.—It is reported that an English syndicate will erect a smelter on the Hacienda de Adjuntas, situated near Monclova, in Coahuila. There are several rich mines in that district from which the proposed smelter could draw a supply of ore. El Panuco mine, which is controlled by Otto Wahrmond, of San Antonio, Texas, contains high-grade copper ore. Mr. Wahrmond and associates recently finished building a railroad 40 miles long from the mine to Monclova, where it connects with the Mexican International.—El Rayo Mines Co. is said to have acquired the properties of the Buena Vista Consolidated Gold Mining Co. in the Santa Barbara district of Chihuahua. This company has also taken over the properties of the El Rayo Mining & Development Company.

The 800-ton lead and copper smelter of the American Smelting & Refining Co., now being erected at Chihuahua, is nearing completion. It will be blown in next November. It is stated by Willard S. Morse, an official of this company, that it has about 70,000 tons of its own ores and more than 30,000 tons of fuel tied up along the line of the Mexican Central on account of the car shortage. He says that a number of mines have had to shut down because of lack of cars. Very few of the smelters in Mexico are working to their full capacity.

Joplin, Missouri.

Big Production.—Slackening Market.—Record of Shipments.—The Mining Congress.—News from the Mines.—Several Strikes.

The highest price reported paid for zinc ore last week was \$51 per ton on an assay basis of \$46 to \$48 per ton of 60% zinc. These prices have ruled all during this month and there is no indication of a change at present. Lead ore has taken a big slump since the first of the month, dropping from \$83 to \$78 per ton in the week of June 8, then to \$76, and last week to \$74 as the high price. There is a light demand and the sales are far below the average for the previous months of this year. As regards production, the district was never in better shape, the zinc output being about 6,300 tons and the lead production nearly 1,000 tons per week.

Shipments.	Lb.	Lb.	\$
Week of June 22.....	12,537,330	1,315,560	330,288
25 weeks this year.....	303,228,280	46,902,600	8,986,886
25 weeks last year.....	261,504,390	38,513,150	7,019,742
Increase	41,723,890	10,386,450	1,967,144

The publicity committee for the coming Mining Congress, the official call to which has just been issued, has commenced work by establishing a bureau with Jesse A. Zook in charge. An active campaign of advertising will be undertaken by the bureau and kept up all summer, increasing in volume as the date approaches. It is the purpose of the committee to give the most complete and comprehensive publicity to this convention. The new \$600,000 Connor hotel will be completed and opened the first of November, and with the other local hotels will be in position to accommodate all the delegates and their friends.

The Federated Mines & Milling Co., one of the largest operating companies in the entire district, with mines at Joplin, Webb City, Alba, Neek City, and Badger, has just purchased a 40 acre fee adjoining Allen Hardy's Big Indian mine at Neek City. Before buying this land 14 drill-holes were put down and ore encountered in all but two of them. The faces of ore varied from 12 to 35 ft. at depths between 185 and 220 ft. The property gives evidence of being a splendid one, and developments will be pushed vigorously.—A 16-ft. face of zinc ore was encountered in a drill-hole by the Uneeda Mining Co., operating in the Porto Rico sub-district, at a depth of 185 feet.

Southeast of Granby, at Newtonia, a development company is drilling the Duval and Wyatt lands, and the results are promising. On both lands ore has been found above the 200-ft. level but the drills will continue to the 300-ft. level, in the hope of finding the deep run of mineral that is thought to exist in that vicinity. The strike of zinc ore, made by Scott & Coleman on the C. W. Tooker land at Aurora, is considered to be one of the richest and biggest finds ever made in that locality. There is a face of over 80 ft. of rich zinc, and it was made on land never before prospected. The recent strike on the McLain land looks good, but it will take some development to prove its worth. Aurora is just at present in splendid shape and the turn-ins are growing rapidly.

The new owners of the Politicians mine are highly pleased with their property, which they purchased last week for \$65,000. It consists of a 20-acre lease and a new mill, which had just been completed at a cost of \$15,000, and had only been operated one day when the deal was made. The property is located in the Zincite sub-district, northwest of Joplin, and several other new strikes have been made there recently.—Sparks, Moore & Henderson, of Galena, have made a rich strike of mineral in a drill-hole on the Murphy land at Galena at a depth of 75 ft. and have penetrated 65 ft. of ore. Work of sinking a shaft will begin at once.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

THE rim of a pulley intended to carry a flat belt is generally slightly rounded, in order that the belt may remain in the centre of the pulley-face, instead of working to one side, as is the case with flat-faced pulleys. The amount of this rounding may be taken equal to one-twentieth the width of the belt.

SINCE the circumferential velocities of any two pulleys, which are connected by one and the same belt, are the same without regard to the diameter of the pulleys, and since the circumferences of the two pulleys are directly proportional to their diameters, the ratio of the numbers of revolutions of the two pulleys is equal to the inverse ratio of their circumferences, diameters, or radii.

BELTS are commonly made of leather, cut into strips of the required width, and riveted together at their ends to make up the required length. Strips taken from the back part of the hide, and oak or hemlock tanned, are generally considered the best, although some kinds of patent-tanned leather are said to have great adhesive power. Cow's hide is almost invariably used for the leather of belts.

OWING to differences in form, texture, color, etc., gypsum presents several varieties, some of which have been given distinct names. The ordinary form in which gypsum occurs in the workable deposits is as massive or rock gypsum. Alabaster is a pure white, fine-grained, massive gypsum, occasionally used for statuary, etc. The term selenite is applied to the crystalline, white, almost transparent gypsum.

SALT occurs in lagoons along the Gulf coast and in many salt lakes, or 'salines,' throughout Texas, from which much is taken annually. No report of this production reaches the United States Geological Survey. The region of present commercial importance is in Van Zandt and Anderson counties, where salt is made from artificial brines drawn from wells which enter heavy beds of rock salt in Cretaceous strata at several horizons.

IN the search for and the mining of tourmaline, beryl, topaz, kunzite, and other stones peculiar to the southern counties of California, some wonderful crystals of rose-colored beryl implanted on feldspar and many fine crystals of tourmaline (red and green) are found, and in connection with these occur many specimens of great interest to the science of mineralogy. The region bids fair to excel that of the Ural Mtn., which for more than half a century has led the world in such products.

THE bituminous sandstones of California are well developed in the vicinity of Santa Cruz. They are, in fact, beach or marine sands heavily impregnated and loosely cemented together by the asphaltic residue of a heavy oil similar to that which is raised from submerged beach sands at Summerland and elsewhere in California. The hard Ventura county asphalts show a more advanced stage of the process which has gone on in the beds near Santa Cruz. The beds containing these hard and soft asphalts have been determined to be of Tertiary age.

TITANIUM is unique among the metals used for steel alloying purposes, as the raw material, that is, ore containing titanium, is most abundant, but the metal and its

alloys are distinctly rare, and while it is known that titanium imparts to the steel most valuable properties, its application is still in its infancy, because the technical difficulties in an economic production on a large scale have not been overcome as yet. The principal advantage of the presence of titanium in steel is that it increases the density of the material and particularly its transverse strength, thus giving a harder chill and better wearing quality.

THE ore deposits of the Kentucky-Illinois fluorspar district occur in veins along fissures produced by faulting of the sedimentary rocks. The principal mineral occurring in the veins is fluorspar, the remarkable abundance of which is the striking characteristic of the district. Calcite, quartz, and barite are likewise abundant. Kaolin is occasionally associated with these minerals. The original metallic minerals of the veins are galena, blende, pyrite and marcasite, chalcophyrite, and stibnite. Few secondary minerals have been reported. The principal are cerussite, smithsonite, limonite, malachite, and native copper.

IN deciding on the length to cut a belt to fit over two pulleys, the easiest way is to stretch a steel tape over the pulleys in the same position that the belt will have, thus getting the length directly; and if a rubber belt is used, allow one-quarter of an inch per foot for stretch. For instance, if in this way the measurement should show a length of 28 ft. required, cut it seven inches shorter than this, and it will fit. If it is not convenient to measure in this way, the length can be accurately computed by the use of a formula involving the distance between centres of the pulleys and the two radii; or a good solution may be had by graphical methods, the result being scaled from the drawing by a rule.

FOR the purpose of experiment, a number of tool steels have been made, the carbon percentage varying from 0.4 to 2.2%, and the method of hardening was to heat the steel to the highest possible temperature without destroying the cutting edge, and then to cool rapidly in a strong air-blast. By this simple method of hardening it was found that the greatest cutting efficiency is obtained where the carbon ranges from 0.4 to 0.9%, and such steels are comparatively tough. Higher percentages are not desirable, because great difficulty is experienced in forging the steels, and the tools are inferior. With increasing carbon contents steel is also very brittle, and has a tendency to break with unequal and intermittent cutting.

FOR all practical purposes there are two kinds of belt-lug—leather and rubber—between which there is the following comparison: Those who favor leather belts claim that they are in the main stronger than rubber, and they will wear much longer, especially when used for cross or half-cross pulleys; that leather belts cease to stretch after once or twice shortened and re-laced, while those of rubber do not; and that leather will bear contact with oil and grease without harm, while rubber thus exposed will soften, and stretch out of shape. Wide leather belts can be cut up into narrow ones, while rubber belts cannot be cut without injuring the finished edges; also, leather can be more easily repaired when injured than rubber. On the other hand, rubber belts do not need to be riveted, but are made continuous; they do not slip as easily on the pulley-faces as leather, and are cheaper at first cost for the same sizes. It is also claimed that rubber belts endure exposure to cold and wet much better than leather, retain their flexibility better, and do not lose strength as rapidly from wear.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

Dressing Plates in a Mill.

The Editor:

Sir.—Since my article on 'The Position of Plates in a Mill,' which you so kindly published in the MINING AND SCIENTIFIC PRESS a few months ago, I have had some further experience with ruined plates.

On my arrival at this mine, the manager informed me that his millman (who had just left) could not save more than about 20% of the free gold, that he had scrubbed and rubbed the plates for all he was worth, and had used about five pounds of cyanide of potassium on them in one week. Also that the ore contained some lead, which might hinder amalgamation. Just think of it; five pounds of cyanide in one week! Well, at least one-half of the plates were as red as a fox's tail.

Now, Mr. Editor, nearly every millman has his 'dope' to put on just such plates, and most of them speak of it as a great secret, and it never fails. I have my dope also, which never has failed me. I don't know as I have ever given it away before, but will do so now. I washed the plates as usual with clean water, rubbed in some mercury with a whitewash brush, and started up; and you can realize how astonished I was on cleaning up the plates next morning, to find that where the silver plating had not been destroyed, they looked fine and the amalgamation was as good as I ever saw. I then left a good plaster of soft amalgam on the plates every time after cleaning the plates, which soon began to cover the red portion of the plates like new skin growing over a fresh wound. Of course, I had to make good to keep from following the other millman, and well, that was over six months ago, and I am here yet.

That plaster of amalgam that I leave on the plates is my dope. I have tried all the others that I ever heard or read of, and came to the conclusion that where some of them appeared to succeed, it was in reality the plaster of amalgam that was the cause of it. Anyway, it has been my only dope for years, and it does not fail me.

H. P. GORDON.

Hailey, Idaho. June 16.

The Requirements of Modern Mining.

The Editor:

Sir—How can one discuss such an article as this of Mr. Finlay, when one is so thoroughly in accord with it? He has pointed out very clearly the immense field covered by the mining of today, and the utter impossibility of any one man, engineer or other, compassing the whole, even though he be a Napoleon in mining.

The subject is so comprehensive, and its ramifications so numerous and detailed, that the various branches became specialized and sub-specialized long ago, and the engineer who devotes himself to a single metal, as for instance copper, has a sphere ample in itself for all his energies, while men have found their life's work in such apparently subsidiary matters as the cyaniding of gold-bearing sand and slime.

Whence we may deduce the beatitude: Blessed is the engineer who recognizes his own limitations; who does not attempt to decide the details of an ore-treatment, or determine the dimensions of a steam cylinder, or the type of motor for a given piece of work, when he knows there are specialists who can do it more efficiently. For the crux of the whole subject is business results, and modern

mining requires that the balance shall be on the right side of the ledger at the close of the year.

The engineer cannot afford to lose sight of this main object for a single moment, but surely no one would include in the sphere of the engineer or the 'mining man' the marketing of the product. This is again a specialty, and whether the product be copper ingots or 'cuff buttons', its sale is usually entrusted to a man skilled in that particular branch of business.

In short, mining is today a huge departmental business, quite as much so as any of the great emporiums in our large cities, and, if properly conducted, a specialist will be found at the head of each department of mining, milling, smelting, or what not, while in even smaller operations the same system applies, and the manager has, or should have, his staff of surveyor, chemist, electrician, chief mechanic, etc., to attend to the work of each department. The controlling head of all the departments certainly need not necessarily be, and oftentimes is not, a mining engineer, but I believe the chances of continued success are greater if he has had the preliminary training of the mining engineer.

Mine valuation may depend upon just such a change of working conditions (hardly to be termed a "trick of operating" however) as cited by Mr. Finlay; and so may the valuation of a cuff-button factory; and the man who examines the latter and finds that he can by raising the manufacturing costs 10%, raise the grade of the buttons 25% and increase the profits 100% over the existing conditions, will be able to make a successful cuff-button industry and increase its valuation just that much. All of which brings us back to the personal equation, which is just as potent in mining as in anything else.

It generally takes time to discover these possibilities in the working conditions surrounding a mine (or a factory), which is probably the reason why it was not done earlier in the instance referred to, and the valuation made while the original conditions obtained cannot be condemned as inaccurate. It was as correct as the premises upon which it was based, which were also correct at that time. It is these changes of conditions that constantly alter all valuations not only in mining but in all fields of industry, though the difficulty the mining engineer has often to contend with is that after having made a valuation, he is held responsible for any subsequent alteration in value due to changes that are entirely out of his, and often anyone's control. Many base metal mines that were unworkable at a profit three years ago pay handsomely today.

Mine valuation certainly covers much more than the mere sampling and measurement of the ore-reserves, as Mr. Finlay points out. In the determination of the further problems, experience and matured judgment count here as elsewhere. But, surely, it is within the province of the engineer to determine the financial features, by which I mean the capital upon which the property can pay interest, and the proper amount of working capital required to reach the producing stage. It is quite true that these features are oftentimes not left to the engineer to determine, but that he should be competent to deal with them is in my opinion self-evident, as the determination of the amount of profit available from a given ore deposit is the chief object of the examination and upon this base the financial superstructure must rest.

Many perplexing questions often arise in this connection, due to the inevitable overlapping of the technical and financial departments of the mining business. Engineers have been censured by some for daring to step out of their prescribed province of ore-reserves and profit in sight, and condemn a mine because of its over-capitalization, but nevertheless this is oftentimes not only a legiti-

mate but a necessary thing to do. If the instructions definitely limit the work and opinion to the amount of ore and the net profit in sight, the engineer's skirts are clear of further responsibility. But if, as is so often the case, he is requested to take a comprehensive view of the whole proposition, he is forced to look at the financial side as well as the technical. For instance, if one is aware that certain debentures or other debts exist on a property under examination, shall the engineer with only general instructions to examine and report, omit to set off this debt against the amount of profit he finds in sight.

To my mind it is clearly his duty not to omit the debt as the report read by one unacquainted with the financial condition of the company, gives otherwise a false idea of the position.

These are perhaps ethical questions, but they are very practical ones, and they tend to show forcibly how the different departments of mining overlap, though one could of course cite instances in the geological, metallurgical, or other branches of the industry that would demonstrate this equally well. In short, the interdependence of the various departments of mining makes *co-operation* the chief requirement of modern mining today. The geologist, the metallurgist, the chemist, the engineer, the financier, all must co-operate in solving the problems connected with a single ore deposit and its successful exploitation, and when this co-operation is properly applied the results are assured.

That the ultimate head of the entire business is so often the financier is only natural. It is the case in most industries.

THOS. H. LEGGETT.

London, May 24.

The Rejected British Workers.

The Editor:

Sir—Those acquainted with the practical and economic conditions that obtain on the Rand at the present time, will not be surprised at the cabled news that the mine-owners wish to give the Afrikaners a trial to become rock-drill men, in place of the British and foreign miners that have evidently come to consider it as their special right and privilege to make money out of the Rand gold-mining industry.

Doubtless many will think that they see in this movement some further wickedness on the part of the capitalist, or of 'slimness' on the part of the Boer Ministry, according to their political views. Others, better informed and less prejudiced, will see in this experiment that the mine-owners wisely intend to leave politics alone and are willing to join hands with the Boer Premier in all efforts that he may make to foster the one industry upon the success of which all others must depend.

The Afrikaner has, generally, a good knowledge of the various Kaffir languages and consequently knows how to get the most out of Kaffir labor, an art in which the British or foreign miner frequently fails. There are many who, I think very rightly, contend that there are probably sufficient Kaffirs in South Africa to supply the mining industry even without the aid of the Chinese coolie, if only worked at anything like fair efficiency for wages received. The British and foreign miners have been spoiled by too much assistance from so-called cheap unskilled labor, and mine-managers have often themselves been guilty of permitting the miners to use Kaffir labor extravagantly, so that, as a matter of fact, Kaffir labor was the reverse of cheap.

The Boer Ministry, being well acquainted with this side of the question and having undertaken gradually to replace the Chinese coolies with Kaffirs or other natives,

is well aware also of the limited supply of Kaffirs at all fit for mining work. It is now suggested to mine-owners that an earnest attempt should be made to give employment to a class of men who know how to live economically in the country, are content to permanently reside in it, and will (unlike all the rest, whether Kaffir or British) spend their earnings within the Transvaal, instead of in Portuguese territory, China, or Europe. All mining communities recognize the inestimable advantage of a permanently resident set of miners, who live with their families and whose children take their places. Surely, if for economic reasons, the British or foreign miner refuses to accept the pay that the Afrikaner is well content to take, it is merely a question of the survival of the fittest, and no blame can be attached to the mine-owner. On his side, the mine-owner, tired of quarrels and of being hollied by labor-unions, turns with relief toward a class of men like the Afrikaners, who as yet know nothing of unions and strikes and other labor combinations, are not clannish like the Cornishmen, and after a few short months of trial work should be quite as able to learn how to work the machine-drills as Kaffirs and coolies. All that would then be needed, is the intelligent minerlike superintendence by the employment of a comparatively limited number of highly experienced and well-paid miners, engaged to make the rounds of the working places, and see that the drill-man, whether he be Afrikaner, Kaffir, or coolie, was breaking down his rock to the best advantage, pointing holes in the right directions, and finally charging and blasting them. Shareholders in the Rand mines will rightly hail with delight all these most sensible movements toward effecting greater economies in working. It is silly for home politicians and others to now cry out that in this experiment to give the Afrikaners a chance to become miners, the Boer Ministry wishes to oust the British from the country, or that the mine-owner (rightly disgusted with the Chinese 'slavery' talk), is going to have his revenge on the Government by also appealing, through false arguments of Boer employment against Britain, to the universally ill-treated taxpayer of war debts.

It is all quite natural, simple, and business-like when looked at through any other spectacles but those worn by the prejudiced politician, or even by those others who always under all circumstances are suspiciously looking for "the nigger in the fence."

EDGAR P. RATHBONE.

London, June 14.

MINING IN SWEDEN.—From the latest official reports there were 326 iron mines worked in Sweden in 1905. The total production was 4,464,833 tons of ore. This is a decrease of 10 mines, but an increase in the output of 380,888 tons, compared with the previous years. The total value of the ore products was \$6,164,784, against \$5,700,005 in 1904. During 1905 there were in operation 129 furnaces, producing 539,437 tons of pig iron, worth \$10,091,896. There were also 511 other iron and steel concerns producing ingots, etc. The value of the unwelded iron blooms was \$5,379,702, of ingots \$9,835,654, and of blistered steel \$47,159. The value of the charcoal used in the whole iron-producing industry was \$5,858,852.

—There were also produced in Sweden, gold ore valued at \$36,450; silver and lead, \$52,801; copper, \$114,255; manganese, \$7,961; zinc, \$796,666; sulphur pyrites, \$59,019; coal, \$636,550, and clays, \$106,313. The number of persons employed in the manufacture of the different metals was 3,222. During the year, 1,107 accidents occurred, resulting in 30 deaths. There were 91 strikes, involving 113 establishments and 8,950 laborers.

Suggestions for Field Observations of Ore Deposits.

By S. F. EMMONS.

*The first task of a geologist in examining a mining district is to obtain as clear and accurate an idea as possible of its structure and geological history. If it is impracticable to make an exhaustive study, he should at least endeavor to trace the important dynamic events that have brought about the existing structure. It may be assumed that, with rare exceptions, ore deposits are the result of concentrations, often many times repeated, by waters circulating within the rocks, of materials previously disseminated in a less concentrated form elsewhere. Such circulating waters always tend toward channels which admit of more ready circulation, what Van Hise calls 'trunk channels,'† and these channels have in most cases been produced by dynamic stresses; it is evident that their study presupposes a knowledge of the orographic history of the region.

Furthermore, as a general rule, the various processes attendant upon ore deposition tend to obliterate structural and textural features of the rocks and often one can only study these features satisfactorily at some little distance from the actual ore deposits.

The phenomena to be observed fall naturally into three classes, though their observation may be simultaneous: (1) Mechanical; (2) mineralogical and chemical; (3) economic or commercial conditions.

The first have to do with the water-channels, hence with the form and probable extent of the orebodies. The second, with their mineralogical composition and the nature of the chemical processes which resulted in their deposition; the third, with the extraction of the ores and their subsequent reduction to the metallic condition.

MECHANICAL PHENOMENA.

1. *Vein-fissure Fracturing.*—The most evident result of mechanical stresses on rock-masses is the formation of fractures or fissures, which when mineralized may form veins. These fissures are in general, strictly speaking, fault-fissures, though the displacement is often so slight as to be imperceptible. On the other hand, large structural faults are not often found to be mineralized sufficiently to form orebodies. Some writers on ore deposits speak of vein-fissures as sometimes resulting from contraction, but I have yet to learn of a well authenticated instance. I regard a certain amount of movement as necessary to break the cohesion between the respective walls of a joint or fissure sufficiently to make a water-channel. This I hold to be true also of eruptive contacts. Observations bearing on these points are useful. It is to be noted that a contraction-fissure could not extend from one rock into another.

2. *Direction of Fissure-planes.*—The direction of fissure-planes, both in dip and strike, and their relation to the general joint or fissure-systems of the region should be determined; but it should be borne in mind that in nature fissures are not mathematical planes but more or less warped surfaces. The average direction of a given system must be determined from as large a number of observations as possible; a few, however accurately determined, will not necessarily give the true direction.

3. *Periods of Fissuring.*—Find out whether there has been more than one period of fissuring; whether one set of veins crosses and throws another. Here caution is necessary, for there may be an apparent throw produced

by contemporaneous fracturing‡. A vein may end against another and be apparently continued on the other side at a given offset, but if the latter has faulted the former there should be internal evidence of movement in the vein material, and other veins of the same system should be faulted in like manner and amount. The burden of proof is on the faulting. If the evidence is conclusive, the second period of faulting should be correlated with some known dynamic movement of the region.

4. *Post-mineral or Secondary Fissures.*—It is important to look for evidence of recent or post-mineral faulting that may be connected with secondary enrichment of the deposits; where, as is often the case, this is parallel, or nearly so, to the plane of the vein, it is sometimes difficult to detect. It may show merely as a clay selvage; it may be a distinct breccia zone carrying fragments of ore, quartz, and country rock. The criteria are ground-up fragments of ore, and moisture that evidently comes from the surface; unless one of these is present one can not be sure of its secondary nature. If the country rock is feldspathic, there is often kaolin-mud in the secondary fracture.

5. *Character of Fissure.*—In regard to the character of the fissure; it may be a single strong fissure, or a combination of parallel fractures, which may be sufficiently numerous to constitute a shear-zone. In the case of the single fissure the vein material is more likely to be the filling of an open space and to be enclosed within well defined walls. Even in this case, however, there are likely to be fragments or sheets of country rock that fill a considerable portion of the space between the walls, and one must observe closely whether the vein material is not in part the replacement by quartz or metallic minerals of some of this dragged-in material. Cross-cuts in either wall should also be observed to see whether the supposed wall is actually the lateral limit of mineralization, or if there are not mineral-bearing fissures behind it.

6. *Fissure Zones.*—In the fissured zones the ore is more likely to be a replacement of the country-rock by mineral solutions eating outward from the crack or fissure, in which case the walls which define the lateral limits may be wanting. When the ore follows for a certain distance one fissure, then passes by a cross-fissure to another nearly parallel, but set off a little to one side, and so on, it constitutes a 'linked vein.'

7. *Influence of Country-rock.*—The country-rock has some influence on the character of the vein-fissures. Where it is a homogeneous mass the vein systems are likely to be regular; but in passing from one rock to another the character of a given fissure may change. The character of such changes should be noted. In passing from a rigid rock to a plastic one a wide vein may pinch to a mere crack.

8. *Indistinct Fissures and Mineralized Dikes.*—There may be nothing that one could strictly call a vein along the zone of fracture; simply a shattering of the rock and an impregnation or replacement by silica or vein minerals. This is likely to occur in siliceous rocks. Not infrequently there has been a first intrusion of igneous rock in dike form along such a fracture and subsequent movement within the dike which is usually so decomposed in the vicinity of the orebody as to be little more than a mass of clay. Such occurrences require following out along the strike to some less altered region and the detailed study of intersections for a determination of actual relations.

9. *Ore Chimneys.*—What the miner calls a 'chimney'

*This valuable contribution was received from its author with the following note: "I beg to submit for publication the following suggestions for field observations in economic geology which I have been in the habit of making to geologists of the Survey, thinking they may be of use to some of your readers."—Editor.

†Some principles controlling the deposition of ores, *Trans. A. I. M. E.* Vol. XXX, 1900.

‡Daubrée's experiments on tonstonal strains, *Géologie Expérimentale*, p. 310.

of ore'—a body of a rudely circular cross-section—is apt to be difficult to characterize. Sometimes it is a fairly solid mass of metallic minerals; sometimes they simply form the cement for breccia fragments of country-rock, in either case largely by replacement. I have generally been able to account for such bodies as zones of more or less shattered rocks at the intersection of two or more fracture-planes. Such planes may be difficult to recognize in the immediate vicinity of the ore, being obliterated by the action of mineralization, but they can generally be found in the neighborhood.

10. *Ore bodies in Limestone.*—Because of their solubility the channels that admitted the solutions to rocks like limestone are often difficult to trace; the ore is more likely to be a replacement than a cavity-filling. Cases do occur where it is the filling of well defined fissures, and occasionally of open caves. In such the bands of successive deposition or 'crustification' should be recognizable. Existing caves can often be proved to be of later formation than the ore. Bounding bodies of more or less pervious rock will have an important influence upon the circulation of solutions and this influence should be studied. When the solutions have passed along a given fracture or joint-plane and then crossed to another their track may be difficult to follow. In one place a large chamber of ore may have been formed, and this may be connected with another by a crack so small as to be scarcely visible. It is in the unreplaced or barren portions of the rock that one can best detect the fracture-systems. In bodies of replacement in limestone the ore generally grades quite slowly into unreplaced rock with no defined boundaries. In the midst of a large body of unoxidized ore one can generally trace, along the walls of the drifts that have been opened long enough to allow the dust to accumulate on the walls so as to deaden the metallic luster, the bedding and joint-planes of the original limestone, and sometimes, in the roof, the crack through which the mineralizing solutions entered.

11. *Ore in Limestone Near Intrusive Bodies.*—Where large bodies of igneous rock have been intruded through or across limestone beds and mineralization has ensued, caught-up fragments of limestone wholly or partly enclosed in the igneous rock are often so completely replaced by ore that no limestone can be found. One may detect, however, some relics of the rock structure or some of the lime-silicate minerals into which the limestone has been transformed. Where there has been faulting near the contact of limestones and igneous rocks, mineralization often takes place in the fault material; interstices are filled and limestone fragments replaced.

12. *True Contact Deposits.*—Finally, there are ore deposits in limestone in the vicinity of large masses of crystalline eruptives where no related fracturing or joint systems can be traced. Ore minerals are associated with contact minerals, such as amphiboles, garnets, vesuvianite, etc., and magnetite or specularite are mixed with pyritous minerals; the orebodies are extremely irregular in form and have no definite boundaries; they are often crossed by dikes of eruptive rock that are neither mineralized themselves, nor have appreciably disturbed the orebodies. To these has been ascribed a probable pneumatolitic origin and the name 'contact deposits' proposed. When such are observed they should be studied with special care.

13. *Observations in Mines.*—If one has occasion to examine a mine with extended workings, one should first study the map of these workings and endeavor to form some idea of the underground structure from such trustworthy information as may be given. One should

take into the mine with him a copy of the drifts he has to examine, or a rough reduction thereof made in his note-book. In his journeys through the mine, let him keep mental account of the structure and of the bearing upon it of the phenomena observed. If they do not fit the hypothesis adopted, let him stop from time to time and reason out what other conception they better fit. Before leaving the place, let him construct cross-sections to graphically test his hypothesis. If he has not accurately measured data, let him get the best approximations available. Thus, he will often be able to decide where the critical points lie and to settle the question by a final visit; whereas, if it were left until he returns to the office, it might necessitate waiting until another season before the decision between the two alternative hypotheses could be arrived at.

CHEMICAL AND MINERALOGICAL PHENOMENA.

It is assumed that the geologist is familiar with the more common ore minerals and with their appearance in ores, which often differs considerably from what is ordinarily seen in mineral collections.

14. *Zones of Oxides and Sulphides.*—In examining a mine he will note the zone that separates the original deposit, the sulphides, arsenides, antimonides, and tellurides, from the oxides, carbonates, and sulphates, which have resulted from their alteration by atmospheric waters; he will see whether there has been any enrichment or impoverishment of the ore above or below this line, any segregation of the metals by migration, and endeavor to trace the causes thereof. It sometimes happens that a mineral occurs in the oxidized zone whose corresponding original is not found in the lower zone. For instance, oxide of manganese, whose original form would be the carbonate or silicate, rhodochrosite or rhodonite.

15. *Iron Deposits.*—In iron deposits one should endeavor to determine whether they result from the oxidation of sulphides or were originally deposited as oxides. In the latter case if they occur in igneous rocks, let him look for evidence that they were formed by magmatic differentiation, and if such evidence is found, let him also search for evidence of subsequent concentration by aqueous agencies. If in sedimentary rocks, let him see if they have been formed by a concentration of disseminated material by surface or other waters, or are simply residual deposits.

16. *Copper Deposits.*—In copper deposits it may be assumed as a general rule that the original form of the deposit was chalcopyrite associated with more or less iron pyrite; generally more. Enargite is also an important source of copper which so far as known at present is an original mineral. Evidence bearing upon this point is valuable.

17. *Silver Deposits.*—In silver deposits this metal is generally associated originally with iron, lead, and zinc sulphides; also with copper sulphides and sulpharsenides. The less valuable minerals are likely to much exceed in bulk the silver minerals, the latter very frequently being indistinguishable except under the microscope. If there are large bodies of very rich silver ore not far below the zone of oxidation there is reason to suspect secondary enrichment and to look for evidence of it.

18. *Gold Deposits.*—In gold deposits it is important to ascertain whether the gold was originally in the form of telluride, for in this case the cost of reduction is likely to be much increased. This is difficult unless the ore is exceptionally rich so that the tellurides are visible to the naked eye. Make note of any trustworthy analyses and bring in material for chemical and microscopical tests.

19. *Secondary Enrichment.*—It is important to look

for evidence of secondary enrichment, as this may afford criteria for judging of the probabilities of the continuance of pay-ore in depth. It is based on the broad general fact that the sulphates formed by the oxidation of sulphides near the surface are leached down, even into the unaltered portion of the deposit, and in the presence of relatively large masses of iron sulphides will be reduced and re-deposited as sulphides. In this process segregation of the metals may take place according to the differing solubility of their sulphates and their affinities for sulphur.* Climatic conditions and the amount of erosion that the region has been subjected to have a bearing upon the process. The favoring structural conditions have already been mentioned. Some of the mineralogical indications follow :

20. *Copper Deposits.*—In copper deposits, the richer sulphides, chalcocite, bornite, and covellite have been found in most cases to be secondary enrichments of chalcopyrite. The amorphous black ore often occurring near, the line between oxides and sulphides, sometimes called 'sooty' ore, is definitely the result of leaching down and re-precipitation. It has hitherto generally been called 'black oxide' or 'oxysulphide,' but chemical examinations of specimens tested thus far have proved them to be an impure chalcocite. If found in such quantity that it can be obtained free from impurities it should be saved for chemical tests. Large bodies of iron oxide that result from the oxidation of iron sulphide may be expected, if they contain a trace of copper, to pass downward into pyritous ores, enriched by copper sulphide, and then into normal pyrite with a little copper sulphide.

21. *Silver Deposits.*—In silver-bearing ores the very rich silver minerals, such as horn silver and the native metal, occur in the oxidized zone. The rich sulphides, arsenides, and antimonides, with the mixed minerals polybasite, tetrahedrite, etc., in the sulphide zone are liable to be of secondary origin. This can be proved when they are the last deposit in vugs and cavities and are connected with water channels leading to the surface. Native silver may also occur in the sulphide zone as the result of secondary alteration.

22. *Base-metal Deposits.*—In the baser ores, where, as is not infrequently the case, there is a decided predominance of lead compounds in the upper portions and zinc and iron sulphides at lower levels, there is a suggestion of re-distribution since original deposition in virtue of the lesser solubility of the former. Gold, though readily insoluble, is attacked by ferric sulphate and precipitated when the latter assumes the ferrous condition. This, together with the fact that near the surface the soluble sulphates of the other metals are more readily removed by surface waters, will probably account for the common decrease in value of gold ores from the surface downward.

ECONOMIC AND COMMERCIAL CONDITIONS.

23. *Conditions of Persistence.*—The geologist is generally expected to give some opinion as to the future of a mine or mining district. He must summarize the evidence gathered. Favoring conditions for persistence are (a) evidence of strong dynamic action, which would produce strong fissure-zones and abundant water-channels; (b) abundant igneous intrusions, and evidence of strong chemical action in the alteration of the rocks, and (c) a visible impregnation of the rock-masses in general with metallic minerals, even if of no commercial value. The most important is the actually proved existence of large bodies of valuable ore. As a rule, large bodies of low-grade ore will lead to more permanent industry than very rich ores.

24. *Commercial Conditions.*—The general commercial conditions should be also considered; the proximity to and accessibility of the region to railroad lines, and consequent approximate cost of bringing in supplies and machinery and taking out ores; the question of supply of water for generating power, or for reduction purposes; of timber for building and mining work; of fuel for steam, and, if need be, for smelting, must be considered. Copper ores and most lead and zinc ores involve smelting operations, hence in their case cheap transportation is more indispensable; whereas, gold ores can frequently be reduced on the spot by amalgamation, cyanidation, or chlorination, and this may often be carried on at a profit in relatively inaccessible districts. It must be borne in mind, however, that telluride and pyritous gold ores generally require preliminary roasting.

25. *Historical Data.*—Data should be obtained on the spot as to the history of discovery and development of a mining region, paying especial attention to facts which bear upon what might be called its economic evolution. Also, all trustworthy data that may be of use in estimating the aggregate production of the various metals mined.

RUSSIAN IRON INDUSTRY.—Notwithstanding the depression in the Russian iron industry, the extraction of the southern hematite ores continues to increase. This is due to the rapid growth in the export of these ores to Silesia and Westphalia, which rose from 220,000 tons in 1905 to 460,000 tons in 1906, which was about 10% of the output. In view of the small available quantity of these ores, estimated at only 66,000,000 tons, this increase in the export is causing some anxiety to the local mill owners, as the other ores in the district are of poorer quality and less importance, the output having decreased from 180,000 tons in 1899 to 28,000 tons in 1906. The peninsula of Kertch, on the other hand, possesses valuable deposits of the metal, estimated at 466,000,000 tons, but owing to the backward condition of the industry in this region the yearly amount of ore smelted is not above 250,000 tons. The mines of the Ural, where the largest deposits of the ore are to be found in the Empire, have been forced to restrict their output. It is hoped to extend the market for these ores to the south, and by a reduction of freight rates and a more thorough utilizing of the inland waterways, to lay down the ore at the Don foundries for about \$3.84 per ton, a price only slightly higher than the local hematite ores. If the South can obtain the Ural ores at that figure the future of its iron industry is assured, and the local mill owners can view the export of their hematite ores to Germany with indifference.

THE uses to which diatomaceous earth are put are constantly increasing, and the methods of application are developing. Formerly employed solely for abrasive purposes, it soon became useful in the manufacture of polishing powders, soaps, etc.; but its abrasive quality is not its most valuable one. Its porosity makes it a good absorbent, and it is extensively used in the manufacture of dynamite from nitroglycerine. Being very light and a poor conductor of heat, it is valuable for use in the manufacture of packing for safes, steam-pipes, and boilers, and of fire-proof building materials. It also serves as a base for the manufacture of cement suitable for withstanding heat. It is a good filtering substance, and is so used commercially. Some of the earth from the Lompoc region is said to be used in the refining of beet sugar. In the Lompoc region, and also at Monterey, farther north on the California coast, it is used in the construction of buildings. The shale is easily quarried into smooth blocks.

* See papers of Van Hise, Emmons, and Weed for details of the processes, *Trans. A. I. M. E.*, Vol. XXX, 1900.

Cyanide Practice at the Homestake Mills.

Written for the MINING AND SCIENTIFIC PRESS
by F. L. BOSQUI.

Apropos of recent descriptions of filtering processes, including the Butters, Moore, and Ridgway systems, some account of present Homestake practice, compiled from notes taken on a recent visit to the property,



Precipitation-presses.

may be of interest. By way of preface, and to refresh the reader's mind as to the main facts, the Homestake plants at Lead, in the Black Hills of South Dakota, consist of six stamp-mills, containing an aggregate of 1,000 stamps, and crushing about 4,000 tons per day. The most interesting feature of the mill-practice is the amalgamation. Each battery is provided with four full-size plates, in series, each plate being 54 by 144 in. and $\frac{1}{8}$ in. thick. The first is plain copper, the last three are silver-plated. This addition of three silver plates, giving to each 10 stamps of the Anleus (240-head) mill, a total plate-area of 600 sq. ft., and to the other mills an average of 360 sq. ft. per 10 stamps, is a comparatively recent innovation, and has proved an excellent one, increasing the recovery by amalgamation approximately \$200,000 per year above the annual recovery when only one 12-ft. plate was used. The saving by amalgamation is between 70 and 75 per cent.

The leachable portion of the tailing from the stamp-mills (610 stamps), consisting mostly of ore from the deeper levels, is treated, after slime separation, at the Lead plant, known as Cyanide No. 1. This plant has a capacity of about 1,800 tons per day. The oxidized surface ore is crushed in the mills at the north end of the property (360 stamps) and the leachable tailing treated in the annex known as Cyanide No. 2, at Deadwood, four miles distant from Lead. This smaller plant handles about 800 tons per day. Both plants were designed and

installed under the direction of C. W. Merrill, who devised the process and who recently installed the filter-press slime-plant to be described herewith. The practice at Cyanide No. 1 has been well described by Mr. Merrill himself* and needs no further comment.

The system of slime separation in use at these plants has been criticized by some of the advocates of South African methods as less effective than the old pointed-box system. But at the Homestake, the choice of cone-classification has been emphatically justified by the results. An elaborate sizing was not necessary and was not attempted. Exigencies of first cost, space, labor, etc., precluded double treatment; and to make the enterprise profitable, it was essential that all the sand be treated as a separate product, and in one operation. To those familiar with the difficulty of obtaining, without re-handling the pulp, a uniform charge of hydraulically distributed sand that will leach rapidly, the appended figures will seem incredible.

The leachable sand has the following average texture:

Coarse (remaining on 100 mesh) 30%.

Middling (100 to 200 mesh) 32%.

Fine (passing 200 mesh) 38%.

Through this product the solution percolates at the rate of from 3 to 4 inches per hour.

When we consider that all the separate slime passes through 200 mesh, and that this product is in so fine a state of division that 90% of its value is extracted in six hours by filter-pressing, the merits of the Homestake classification system require no further emphasis. The cost of treatment at Cyanide No. 1 which Mr. Merrill gave in 1903 as 35c. has since been reduced to 26c. per ton. At Cyanide No. 2, the product treated is much lower in grade, averaging only 85c. per ton. This plant was the more recently constructed of the two, and is the more perfect, not only in its arrangement, but



Screw End of the Slime-press.

in its facilities for maintaining a low cost of treatment. A summary of the operating cost for six months is given on the next page.

I have mentioned the slime separation as a most interesting feature of these plants. Another novel feature is the periodic introduction of air into the pulp for the purpose of providing oxygen to the sub-sulphide of iron—one

*Trans. Amer. Inst. Min. Eng., New York meeting, 1903.

of the most troublesome constituents of the ore—and so maintaining the dissolving power of the solution, which would otherwise be robbed of its oxygen by the iron. Both of these big plants are remarkable for the order and neatness exhibited in every department. Operations have been reduced to so simple a system that they seem to be working automatically; yet if one glances behind the scene, he finds an able corps of assistants continually studying special problems, looking to the reduction of costs and increased efficiency.

From the two leaching plants, about 1,600 tons of slime have been run to waste, of an average value of between 40c. and \$1.20 per ton. In working out a method for treating this product, Mr. Merrill considered the various slime processes now in favor, but discarded them all as unsuited to Homestake conditions. In treating an 80c. slime, a system requiring the two operations of agitation and filtration in separate vessels was not to be thought of; and the only device in which treatment and filtration could be performed in one operation was the filter-press; but the cost of operating the old type of filter-press was prohibitive, and this condition led to the development of what is known as the Merrill press, which essentially differs from the old type in that it can

slime; the next department contains two large cone-bottom accumulation-vats; the next floor is occupied by the solution storage-vats and precipitation-presses; the next by the slime-presses; and the lowest by the precipitation-vats and dumps.

Two small vats are provided for slaking lime. Their contents are drawn as required to a screen-covered box where the undissolved lumps are separated. This box overflows into an agitator, from which the milk-of-lime is continuously discharged into the main slime-stream at the rate of 5 lb. lime per ton of slime. The two sludge storage-vats are 26 ft. diam. and 24 ft. deep with a 47° conical bottom. The discharge from the sludge-vats passes directly to the filter-presses under a pressure of about 30 lb. through a 10-in. main, which extends through the whole length of the press-building. Between each pair of presses this main branches into a longitudinal 10-in. distributing pipe, which in turn sends two 4-in. branches to each press. These small branches communicate with a continuous channel in the press at the centre of the top, 4 in. diam., by means of which the slime passes to the filter-chambers. Other channels are provided as follows: One at each upper corner, 2½ in. diam., for the entrance and exit of air; one at each lower

COST RECORD AT HOMESTAKE CYANIDE MILL NO. 2, FOR LAST SIX MONTHS OF 1906.

	July.	August.	September.	October.	November.	December.
Total tons of sand treated.....	24,913	25,644	24,496	24,352	24,190	25,398
Total operating cost.....	\$4,165	\$4,609	\$3,941	\$4,380	\$4,122	\$3,274
Cost per ton, classification.....	\$0.018	\$0.017	\$0.017	\$0.017	\$0.016	\$0.023
“ “ “ treatment.....	0.094	0.093	0.079	0.086	0.090	0.080
“ “ “ precipitation.....	0.026	0.021	0.022	0.021	0.019	0.021
“ “ “ power.....	0.021	0.041	0.031	0.048	0.035	0.037
“ “ “ assaying, refining, etc.....	0.008	0.007	0.012	0.008	0.010	0.007
Total cost per ton treated.....	\$0.167	\$0.179	\$0.161	\$0.180	\$0.170	\$0.168

		AVERAGE SIZING OF SAND.	
Total tons treated for the six months.....	148,993	Per cent.	Mesh.
Total operative and treatment cost.....	\$25,493.64	37.55 coarser than.....	100
Average cost per ton treated.....	\$0.171	23.00 between.....	100 and 200
		39.45 finer than.....	200

be discharged without drawing the plates and frames apart. Several good descriptions of the Merrill press and process have appeared in the mining periodicals and I shall not attempt here more than a brief account of the plant.

At the beginning, a 10-ton press with 4 by 6-ft. frames was installed for experimental purposes and was in use continuously for 18 months. In one run 131 charges (or about 5,000 tons) were treated, on which the following data are available:

Average value of slime before treatment, 91c.; after treatment, 10c. Extraction by assays, per ton treated, 90% or 81c. per ton. Recovered in precipitate, per ton treated, 91% or 83c. per ton. The treatment was simply lixiviation in the press, without agitation. Amount of solution used to leach 1 ton of slime, 0.73 tons; amount of water used for sluicing, 4 tons to 1 ton of slime; thickness of cake, 4 inches.

The large plant, recently started, is situated at Deadwood. The slime, after partial dewatering in cone-bottom clarifying vats, which reduces the proportion of water to solid, in the ratio of 3 to 1, is conveyed in two pipe-lines to the slime-plant, as follows: A 12-in. pipe carries it from Cyanide No. 1, a distance of 3¼ miles, at a minimum grade of 1½%; a 10-in. pipe carries it from Cyanide No. 2, a distance of 2 miles, at a grade of 1½%. The plant is built on a steep hillside and consists of five levels. The uppermost contains the apparatus for slaking lime and feeding it automatically into the stream of

corner, of same diameter, for entrance and exit of solution; and one large continuous channel extending along the centre of the bottom, by means of which the spent slime is sluiced out. This channel is 6 in. diam., and along its top is suspended a 3-in. pipe extending the length of the press. This pipe is provided with 92 nozzles, 1 in. long and 5⁄16 in. diam., each of which delivers a stream into one of the 4-in. chambers, under a head of about 50 lb. By a special mechanism, a reciprocating motion is imparted to this pipe, causing it to revolve through an arc of 210°, so that each small nozzle plays against the compact slime-cake, removing the cake completely and cleansing the compartment in about 45 minutes. The discharged slime leaves the press through the crescent-shaped space between the 4-in. pipe and the 6-in. channel, the latter being sealed during the operations of filling and leaching.

The operations within the press consist of leaching with solutions of 0.1 and 0.04% strength, and the aeration of the cakes so essential to good extraction in the Homestake ore. The whole operation, exclusive of filling and emptying, occupies about 6 hours. At the time of my visit, (January, 1907), five of the 24 presses were in operation and working most satisfactorily; the remaining presses were partly set up and were being put into use as fast as the plates arrived from the factory. Under date of February 22, Mr. Merrill writes: “We are now treating at the rate of about 12,000 tons per month and will increase this by several thousand tons per month

until our full capacity of 50,000 tons is attained. Cost data are not obtainable yet, but will not exceed 25c. per ton for all items."

Mr. Merrill submits the following data for January, 1907 :

Tons treated.....	7,670	
Assay-value.....		\$7.85
Recovery in precipitate.....		0.68
Carried over in unprecipitated solution.....		0.09
Total recovery (equivalent to 90%).....		\$0.77

At the present time (May 1) eleven of these presses are working continuously, and with results confirming those of the experimental plant given above.

I have already stated* what I conceive to be the limitations as well as the merits of Mr. Merrill's process. In all fairness it may be said that each of the filtering systems now in vogue possesses distinct merits of its own. The supreme test of the metallurgist in these days of many inventions is to select the *right* process for his purposes, that is, the one uniting the greatest number of advantages when applied to his special problem. Of Mr. Merrill's system it may be said finally and emphatically, that it is an established success, and will consequently have a wide range of usefulness. As for the installation itself, which will cost when completed, a half-million dollars, I question whether in the whole field of cyanidation, we shall find a more ingenious and original achievement, or one more conspicuously uniting metallurgical efficiency with perfection of mechanical detail.

COAL IN CHILE.—Traces of coal-bearing ground have lately been discovered to a considerable extent in Tomé. Preliminary surveys prove that there are veins of the richest coal at a depth of from four to six metres.

PRODUCTION OF COAL IN 1906.—According to statistics compiled for the United States Geological Survey by Edward W. Parker, the total production of coal in the United States in 1906 was 414,039,581 short tons of 2,000



Discharge From Two Presses.



The Great Open-cut of the Homestake.

lb., valued at \$512,610,741. These figures, compared with those of the preceding year, when the output amounted to 392,919,341 short tons, valued at \$476,756,963, show an increase of 21,120,240 short tons, or 5.4% in quantity, and of \$35,853,781, or 7.5% in value. Of the total production in 1906, Pennsylvania contributed 200,546,084 short tons, or 48.4% in quantity, and \$262,182,935, or 51.1% in value, the larger percentage in the value being due, of course, to the higher value of anthracite, which is produced almost exclusively in that State. The anthracite production of Pennsylvania in 1906 was 71,282,114 short tons, valued at \$131,917,694, while the bituminous production was 129,263,673 short tons, valued at \$130,265,241. The anthracite production of Pennsylvania in 1906 was 5,694,142 long tons (or 6,377,439 short tons) less than that of 1905, with a decrease in value of \$9,961,306, while the bituminous production showed an increase of 10,850,036 short tons in quantity and of \$16,871,734 in value.

But little information on mining coal and gold in China is obtainable. During the year the Imperial Chinese Railways opened a coal mine at Hsin Chiu, a place north of Kuangning district, but its output is unknown. Gold mines are reported to have been discovered in that vicinity. At Chinchow a coal mine is worked by native process. An attempt was made to introduce foreign machinery at this place, but for some reason or other the project failed. The Japanese have a mine at Wa Fang Tien that is reported to be of great wealth. Both coal and gold are mined.

Further surveys are being made to determine in a definite manner the class and quantity of coal likely to be extracted.

*MINING AND SCIENTIFIC PRESS, December 15, 1906.

Brazilian Diamonds.

There has been considerable increase in the movement of diamonds from the Diamantina district of Brazil to the United States, although the vast bulk of the output continues to go to Paris and London. The establishment of a concern for cutting and finishing the stones at Diamantina has led to a change in the course of export, and the contract of one of the American mining concerns to purchase the output of other concerns at Diamantina is likely to lead to a still further increase in the American imports. What the output of Brazilian diamond fields at the present time really is can not be given with any degree of certainty. Owing the policy of the State Government in its attempt to tax the stones on export, no records of the finds or of the sales are kept. A private record kept by a diamond mine owner in Diamantina shows that in one district of that field over 4,800 carats of stones were bought from the original holders from September 14 to November 14, 1906. This period was probably an average one, and the output of this particular territory therefore will average about 2,400 carats of stones per month. There are two other similar mining fields in the same country, and while the output of the two combined will not exceed that of the first-named district, it seems very probable that the total output of the Diamantina country at present is about 5,000 carats per month, worth on an average perhaps something over \$40 per carat for mine-run stones in the rough. The income of the Diamantina district from its diamonds at the present time is about \$200,000 per month. This output of the Diamantina diamonds is altogether the production of mining with native means and methods from the so-called *serviços*, which represents no faithful or effective test of the value of the country. These *serviços* are bands of workmen organized into effective squads, sometimes by a large number of workmen themselves agreeing to work together for a season and dividing the output, and sometimes by men with capital enough to hire men for a season, taking the output for themselves. In the dry season the river beds are worked; in the rainy season, the uplands. Rude sluices and wooden pans represent the machinery employed and there is no doubt that a large number of stones are missed in the process. Large numbers of stones are bought from Brazilians inhabiting the surrounding country, and there is no means at present of testing what mining property is worth or how much capital, time, labor, and expenditure the present output represents. Nor is there any means of telling how many people are actually engaged in whole or part time in the work. The mining companies now installing plants in the Diamantina country are almost altogether American. Practically all of them are engaged in getting in their dredging machinery and preparing for active work on a more or less extensive scale. The trouble, expense, labor, and time necessary to accomplish even the more simple tasks in this line can only be fully appreciated by those who have engaged in the work. Diamantina can now be reached in two days by fast mule-back from the end of the railroad, and in the course of a short time a public service of diligences will offer more improved means of making the journey, but the difficulty of transporting heavy machinery in such sections as a mule can carry over mountainous country is apparent.

IN GERMANY, the reopening of several long-abandoned tin mines throughout the Erz Mtn. now seems assured. One mine at Ehrenfriedersdorf is now working and expects to give employment to 200 miners before the summer is over.

The Prospector.

Enquiries sent to this department are answered free of charge, if submitted by subscribers who are not in arrears. The full name and post-office address of the sender must be given, otherwise no answer will be made. Those who are not subscribers must accompany their questions with a fee of \$3 for each question. No assays are made.

The rock sent by R. McM., of Bouse, Arizona, is an Andesite.

A specimen of Carborundum was sent by E. L. B., from Pony, Montana.

Y sends a specimen from Reno, Nevada, which is largely Calcite, Chlorite, and Pyrite.

The specimen from Wallace, Idaho, marked A is Andradite Garnet stained with Malachite.

R. D. sends from Wickensburg, Arizona: A, Andesite; B, Andesite; C, specular Hematite in quartz.

The rosin-yellow mineral in the specimens from J. A. McL. of Goldfield is Sphalerite; the dark gray mineral is Galena.

A fragment of Basalt with seams of specular Hematite was sent from Silver City, New Mexico, by C. H. L. It carries no tin.

The specimens from Olalla, B. C., marked B. C. O., are: No. 1, Wollastonite; No. 2, Epidote and Andradite; No. 3, Gabbro.

Two specimens of crushed and altered rock, now largely Calcite, Quartz, and Hematite, were sent from Sinaloa, Mexico, by A. W.

The specimens sent from Campanillas, Mexico, by E. H. H., are: No. 1, Cosalite, a sulphide of lead and bismuth, with pyrite and chalcopyrite; No. 2, Andesite; No. 3, Andesite.

A. E. I., of Ashland, Oregon, sends: No. 1, Sericite Schist; No. 2, Pyrite, Chalcopyrite, and Covellite; No. 3, Pyrite and Chalcopyrite; No. 5, mineralized Dacite. We would hardly expect the schist to be a copper ore.

T. W., of Great Falls, Montana, sends: No. 1, Quartz with pyrite and chalcopyrite, stained with malachite and limonite; No. 2, Galena; No. 3, Quartz Porphyry; No. 4, Feldspar; No. 5, Calcite, Quartz, and Limonite; No. 6, Calcite.

The specimens sent from Fairview, Nevada, by J. A. P., are: No. 1, Rhyolite; No. 2, Turquoise; No. 3, Andesite; No. 4, Rhyolite; No. 5, Andesite; No. 6, Andesite; No. 7, Andesite; No. 8, Andesite; No. 9, Andesite; No. 10, Chert; No. 11, Rhyolite; No. 12, Rhyolite; No. 13, Rhyolite; No. 14, Quartz.

THE terrible disasters which have recently occurred in the coal mines of Germany and France have directed the attention of scientists, especially in the former country, to introducing methods of protecting the miners against a recurrence of such calamities, or at least of diminishing, as far as possible, the loss of life. One measure contemplated is the construction of safety chambers shut off from the rest of the mine and protected against explosions. A conduit of compressed air is introduced into these excavated rooms, and should the conduit be destroyed, vessels, or bottles filled with oxygen, stored in these chambers, shall supply the necessary air. Preparations are already being made for the introduction of these arrangements in the mines in the region of the Saar.

The Geology of the Coffee Creek Mining District.

Written for the MINING AND SCIENTIFIC PRESS
By NORMAN S. STINES.

This district lies in the northwest corner of Trinity county, California. It is a granite area flanked on all sides by a coarse-grained gabbro, parts of which have been changed, by the alteration of the pyroxene, to serpentine. The granite is probably batholithic in occurrence and is closely related to other granite areas that outcrop to the north and west. This granite area is approximately three miles wide by nine miles long; the longest dimension is north and south. The gabbro flanks this on all sides.

The granite varies in texture from a rock of fine grain, at the contact with the gabbro, to one of coarse grain at some distance from this contact. It contains quartz, feldspar, biotite, and hornblende with the usual accessory minerals. The biotite occurs sparingly. Coursing through the granite in all directions, and standing approximately perpendicular, are many aplite and pegmatite dikes.

The term gabbro is here used in its broadest sense as applying to that class of granitic rocks which are very basic. Locally the gabbro varies from a rock carrying mostly plagioclase feldspar and small amounts of pyroxene to one carrying practically only pyroxene; in other words, all gradations from anorthosite through gabbro to pyroxenite or peridotite.

The anorthosite and gabbro are coarse in grain; some crystals of plagioclase and pyroxene being as much as two inches long and three-eighths of an inch wide. In many cases the ferro-magnesian mineral has been altered to hornblende and serpentine, and in every case the surface rock (by oxidation of the iron) has a reddish color. Unaltered pyroxenite or peridotite is rare, but in their stead is found serpentine. These anorthosites, gabbros, and peridotites do not occur as separate rock-masses but rather as differentiations of the same mass. It is due to the peridotite being more prone to alteration that we find areas of serpentine.

The veins lie wholly in granite, wholly in gabbro, or they roughly follow the contact between the two formations. In one case at least a vein strikes through the granite and continues into the overlying gabbro. The veins are numerous and for the most part strike from N 20° E to N 37° E. In all but one case they dip from 60 to 87° southeast. In that one case the dip is to northwest, but sufficient depth has not yet been gained to be sure that the dip is not a false one due to the creep of the surface. These veins vary in width from mere stringers to 12 ft. In a few instances there are cross-stringers connecting the parallel veins. The distance between parallel veins varies from a few feet to several hundred. It might be said that there are several lodes running through this area.

The quartz constituting the veins may be frozen to both walls, frozen to only one or free from both walls with a gouge on each. Those veins that are frozen to one or both walls plainly show their genesis. They are due to a replacement, along a line of fracture or zone of shearing, of the crushed ferro-magnesian minerals by pyrite; the alteration and kaolinization of the feldspars and the silicification of the sheared zone. It is not uncommon to find in one piece of ore all grades of material, namely, the unaltered granite; the granite in which the outlines of the ferro-magnesian mineral can still be seen, although they are completely replaced by pyrite; that in which all traces, save texture, of the original granite has disappeared; and the white sulphide-bearing quartz that in no way resembles the granite it has replaced. In the veins that are frozen to neither

wall the origin of the ore cannot be so easily traced.

These veins are continuous for long distances; one can be traced by its outcrop for 4,000 ft. Numerous faults, having an east and west throw occur, but in no case does the throw exceed a few feet.

The ore-shoots are found distributed along the strike of the veins. Not sufficient work has thus far been done to determine the dimensions of the shoots and what controlled their deposition. But the following facts stand out clearly:

1. The ore-shoots come to the surface. Their position is indicated by the gold found in the overlying soil. It is often necessary to go through this soil and decomposed granite for as much as 25 ft. before the ore is found in place.

2. The shoots dip to the north at an angle varying from 57 to 85 degrees.

3. They have been formed in the swell of the vein. Where the quartz pinches, the assays drop; in most cases the best ore is found where the vein is the widest.

4. In one case, at least, the north side of the pay-shoot is controlled by a fault and the south side by an abrupt change in the strike of the vein.

The ore, as outlined above, is quartz or some stage of altered granite impregnated with sulphides and other gold-bearing minerals. The economic minerals are galena, chalcopyrite, iron pyrite, sylvanite, and petzite. Sylvanite and petzite are sparingly disseminated throughout the ore, but at times they are locally found in sufficient amount to make bonanza ore. The quartz is a hard compact variety but cavities lined with well formed quartz crystals are sometimes found.

As mined and milled the ore is classed as oxidized and unoxidized. The unoxidized ore is that described above and rarely, if ever, carries free gold, although at times it assays hundreds of dollars per ton. The oxidized ore is found only in the upper workings and always carries free gold with sulphides. The amount of sulphides increases with a corresponding decrease in the free gold as depth is attained. In the oxidized zone there have been found lenses of rich ochre in the regular milling ore. In this ochre the gold is very fine, this being probably due to the accumulation of finely crushed vein-matter, thoroughly oxidized. The extreme richness is probably due to a secondary concentration as the vein was eroded. There is still another occurrence of rich oxidized ore that cannot be explained in this way. The rich ore in this case consists of large crystals of hematite, which are pseudomorphs after pyrite. These are an inch long and are fractured, the fractures being filled with quartz. The crystals carry a great deal of fine gold and this class of ore assays as high as \$6,000 per ton. It seems to be plainly an oxidation of a rich auriferous sulphide. This shoot has not been followed to the unoxidized zone as yet and until that has been done the correctness of this explanation cannot be established. There was one occurrence of large pieces of gold in an oxidized material which suggested that it was derived from the oxidation of large crystals or aggregates of tellurides. The ore as stoped varies in width from 18 in. to 12 feet.

There are no difficult problems connected with the mining of the ore. The walls stand exceedingly well and a minimum amount of timber is required. All stoping is at present done by hand but the unoxidized orebodies would be almost ideal for the use of machine-drills. Any necessary sorting is done underground and the waste is used as filling.

From the nature of the ore, it is obvious that the metallurgy is not simple. All ore found in the oxidized zone yields from 3 to 7% of its gold by amalgamation, the remainder being extracted by concentrating with

subsequent cyanidation of the concentrate and tailing. This treatment gives an extraction of from 82 to 87%, but it is not successful for the unoxidized ore, from which it extracts only 50 to 60%. The most successful mode of treatment for this ore is crushing for concentration only; concentration; roasting followed by re-crushing, then cyanidation of the concentrate, followed by bromocyanide treatment, after sliming, of the tailing.

Dry-crushing followed by roasting and cyanidation give a good extraction. Either of these schemes of treatment should give economic results. The former method was tried on a working scale by a small plant and from tests extending over a period of three months an actual bullion-recovery of 89% was obtained. As yet no practical application of the last scheme has been made. The total absence of lime and other chlorine-absorbing elements suggests the possibility of a successful scheme of treatment by chlorination after roasting.

This district is well favored with respect to wood and water. Most of the mountain slopes are heavily timbered with red fir, sugar, and yellow pine, and the low benches carry an abundance of oak and maple. Streams of water are plentiful. The fall is such that on the larger streams one to two miles of ditch is sufficient to give a drop of 80 to 120 ft. In the smaller streams heads of 100 to 700 ft. can be obtained with short ditches and pipelines. All mines thus far equipped use power derived from the water under pressure. In winter the abundance of snow causes much trouble along the ditches and flumes; by covering them where slides are likely to occur, together with sufficient and frequent watching, this trouble can be eliminated and water-power made available throughout the year.

DREDGING IN QUEENSLAND.—Great activity continues to be shown in dredge-mining. The total quantity of material treated during 1905 by bucket-dredging, pump-sluicing, and jet-elevating, according to the report of the Mines Department, was 13,150,945 cu. yd., as against 10,192,400 cu. yd. in 1904. The gold obtained amounted to 72,953 oz., as against 55,257 oz. for the previous year, the average yield of gold per cubic yard treated being 2.6 gr., as against 2.37 gr. in 1904. The quantity of stream tin won during 1905 was 94 tons 16 cwt. 1 qr., valued at £8,428 7s. 6d. The average quantity of material dealt with per week by each dredging plant was 4,802 cu. yd., and the areas treated during the year aggregated 479.5 acres, the average yield of gold per acre being 152.1 oz. The weekly yield of gold won by each plant averaged 26 oz. Altogether, 82 dredge-mining plants, comprising 26 bucket-dredges, 49 pump hydraulic sluices, 6 jet-elevators, and 2 rotary hydraulic plants, were in operation. The number of men employed in dredge-mining during the year was 2,040, an increase of 540 over the number in 1904. The amount expended by the companies in wages, fuel, and maintenance for the year was £217,164, as against £104,000 in 1904. The sum paid in dividends during the year was £43,412. On December 31, 1905, the number of new plants in course of construction was 38.

AT CAPE BRETON there are immense collieries being worked under the ocean. These submarine mines cover a thousand acres and are being increased steadily. The mines are entered at the shore and the operators follow the vein beneath the water for more than a mile. It might be expected that the weight of the water would force its way into the mine, but a sort of fire clay lines the submarine roof of the mine, and the sediment above this is held in place and packed down by the water pressure until there is not a crevice nor a drop of water from overhead.

A Portable Acetylene Mine-Lamp.

Written for the MINING AND SCIENTIFIC PRESS
By EDWIN O. DAUF.

The use of acetylene lamps is more common in Mexico than in the United States, due, probably, to other illuminants costing more here than in the States.

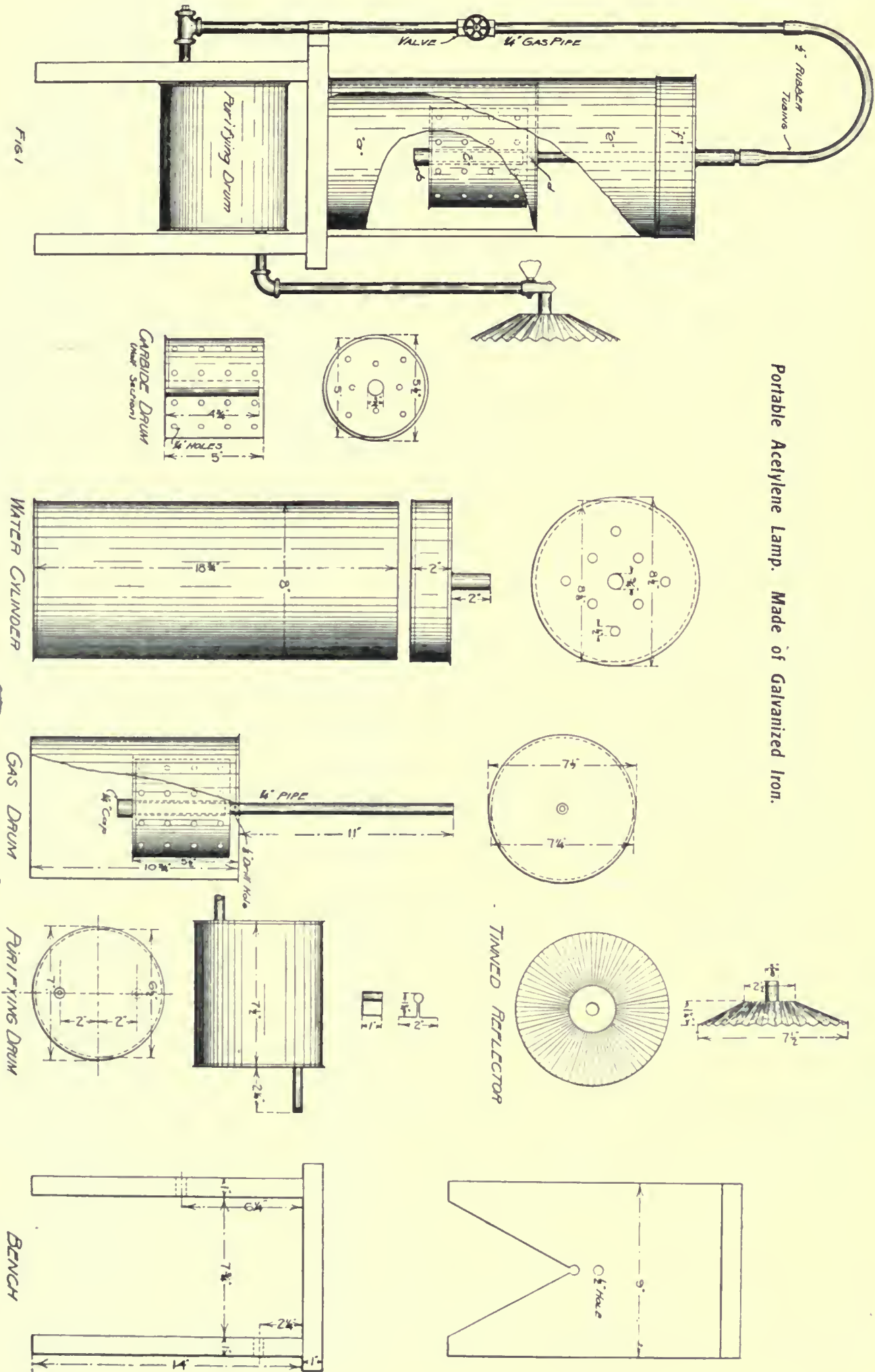
Mexican mechanics often exhibit much ingenuity, the result being that various types of home-made acetylene lamps can be found around mines and other places. Having seen one of these lamps in successful operation in stopes and poorly ventilated places where an ordinary candle or torch would not burn, I have made a drawing of it in the hope that it may prove of value to others that are in need of a cheap light which will burn under unfavorable conditions. The type of lamp herewith described was used in one Mexican mine continuously while air-connections were being driven. Acetylene requiring less oxygen than other illuminants, it was found that faces could be worked where an ordinary lamp or candle would not burn. In large stopes it also proved satisfactory, since the amount of light furnished by one lamp was greater than that of a number of candles or a torch and, the lamp being portable, could be moved from place to place, wherever light was most needed. The lamp can be cheaply constructed; any tinsmith or ordinary mechanic will have little difficulty in making one out of ordinary galvanized iron and a few pieces of pipe.

Fig. 1 shows the lamp assembled and the other drawings show all the necessary details. Referring to Fig. 1, the method of charging the lamp is as follows: The rubber tubing is first disconnected and the cover *f* is removed; the gas-drum *a* containing the carbide-drum is now removed and the cap *b* unscrewed. The carbide-drum can now be slipped off and is filled with about 2 lb. calcium carbide, which should be in rather large lumps. The carbide-drum is now put back into place and the water cylinder *c* is about half-filled with water; now carefully lower the gas-drum into the water, being careful not to allow the carbide to touch the water until the cover *f* is replaced and the rubber tubing is connected. The small valve in the pipe leading to the purifying-drum may now be opened, allowing the air to escape through the drum and gas-jet. As soon as the air has all escaped the drum containing the carbide will come in contact with the water and acetylene gas will be generated. This gas enters the gas-drum *a* and finds its way into the pipe by way of the small hole *d*, and passes into the purifying-drum which is packed with cotton-waste, which will take up any small particles of dust. From the drum the gas passes into the pipe fitted with a Stewart patent gas-tip.

The lamp is self-regulating, for as soon as more gas than can be immediately used is generated, the pressure of gas will raise the gas-drum *a* and, the carbide-drum, being attached to other drum, will be lifted out of the water and no more gas will be generated. As the gas is used up, the gas-drum with the carbide-drum will settle down into the water again and more gas will be generated. The lamp being self-regulating, little attention need be paid to it after charging and starting.

An experimental gas turbine has recently been constructed in France, which showed an efficiency of 18%. The turbine is of the impulse type, the casing being lined with refractory material. Gasoline is used as fuel, and is fed under pressure through an expanding nozzle, being ignited electrically and generating a temperature of combustion of over 3,000° F. The blades were cooled to a certain extent, while rotating, by low-pressure steam admitted into the casing.

Portable Acetylene Lamp. Made of Galvanized Iron.



The Mines and Agriculture of Roman Britain.

Written for the MINING AND SCIENTIFIC PRESS
By ALEXANDER DEL MAR.

The scientific attainments and perseverance of a woman are bringing to light a knowledge of the ancient history of Britain which hitherto has remained a sealed letter. A few months ago, while the workmen upon her estate near Silchester were making some excavations, Mrs. Selwyn noticed the presence of certain ancient Roman and Anglo-Saxon relics in the earth, which she thereupon caused to be removed with particular care and thoroughly sifted. The upshot has been an immense collection of valuable monuments of the past, which, taken together with previous finds, furnish us with a key to the ancient system of mining, agriculture, highways, and fairs. Without further reference to authorities, I shall endeavor to give as complete an account of results as possible.

It appears that after their conquest of the island the first industry to which the Romans applied themselves was gold and silver mining and that while these industries were being prosecuted, the whole island was laid out in a series of military highways, constructed by the Roman provincial government, and of such an enduring character that most of them are in use at the present day. On account of their superior knowledge of mathematical instruments, these roads are believed by some writers to have been planned by Greek surveyors. The military highways were usually made 15 or 16 ft. wide, and as straight as possible. In crossing marshy lands they were laid upon piles driven into the earth. Where rivers could not be conveniently forded, they were bridged, at first with wooden structures, afterward with stone ones, like that across the North Tyne, the magnificent abutment of which, first laid bare in 1867, excites the admiration of the modern engineer. All of these highways have been identified by antiquarians either by means of the Antoninus 'Itinerary' or by the manuscript notes of the legionary commanders, or the mile-stones placed upon the road by the Romans, for some of these are still remaining where they were placed. There have been found 56 milliaries, or Roman mile-stones. They date from 120 to 136, that is, from Hadrian to Constantine the Younger. When the highways were completed and connected with the smaller roads, from the mines, farms, and workshops, Britain possessed for the times a perfect means of communication between every industrial centre, the manufacturing towns, and seaports. In many parts of England, for example, in the vicinity of Cheddar, the modern roads follow the course of the Roman.

Before this period the Imperial Government had constructed a series of great highways, which radiated from the capital in Italy, and penetrated every province of the Empire. Guard and post-houses, the latter provided with relays and horses, ready for immediate use, were stationed upon all of them. They were continually patrolled by a rural police, so that the traveler, merchant, or courier could travel throughout the Empire with safety and speed. The post traveled at the rate of about 100 miles per day. This system was applied by Augustus to Italy, and extended by Tiberius to the provinces. After the Anglo-Saxon invasion, no such system of patrol and posting existed again in Britain until the reign of William IV. The Imperial highways to connect with Britain ran from Italy through Gaul, to Calais, and Boulogne, where they were connected by sailing packets with the roads in Britain. Here the highways were provided with patrols, and posting-houses, as on the Continent.

Gloomy and repelling as the climate of Britain must

have appeared to the Roman colonists, the care that they took to bring its wild lands into cultivation proves that they soon discovered the many advantages it possessed, to compensate them for the absence of the blue skies and serene weather of their native land. Here let it be remarked that the exclusively military character which history has stamped upon the Romans is most misleading. The Romans were also essentially an agricultural people, and we owe to them the knowledge and preservation of nearly all the edible plants and fruits now in use.

It matters not when the legend was invented, which the English still commemorate in Rogation week, and the switching of boundaries; it is sufficient that it obtained credence in the time of Varro, Virgil, and other ancient authors. According to this legend, Romulus established or continued upon a firmer basis the *Fratres Ambarvales*, or the 12 ambling or swaying priests, of Maia, whose functions included supplications (*rogatio*) for favorable crops, the celebration of thanksgiving after harvest, and the marking of agricultural boundaries. All these functions, which were actually performed by officers chosen from the most distinguished families of Rome, evince the agricultural character of the Romans. The careless cultivation of land was an offense, which in the early days of the Republic, came under the cognizance of the censors, and, as Cato informs us, to be called a good husbandman was to receive the highest of compliments. Of the 20 tribes into which the Roman people were divided by Servius Tullius, 16 were rural, and only four were urban; the former holding the highest rank. The noblest families among the Romans, as the Fabii, Pisones, Lentuli, Cicerones, etc., derived their names from agricultural avocations; many of them most eminent men, as Cato, Varro, Virgil, Pliny, Columella, and Palladius, wrote treatises on the subject; and as to implements of husbandry, barring the mower, harvester, and steam-plow, they were but little inferior to those in general use throughout the world today.

That the agricultural character of the Romans did not desert them in Britain, is attested not only by the variety of plants they introduced and cultivated, but also by the extent of forest and marsh land they reclaimed; and although the rough labor was done by captives, it would be unfair to withhold from their conquerors the credit of teaching them the valuable lessons in tillage and horticulture, which, through them, have descended to the modern world.

Roman aptitude for agriculture is evinced by the fact that, even at this distant period, the fruit and vegetable trades of the Western world are largely in the hands of Italians; and in many countries, not merely the trade, but also the cultivation. Even so far west as your San Francisco, the Italians are the principal cultivators and merchants of edible vegetables. In London, from the largest wheat merchants, who are Italians, to the ancient costermonger class, who are supposed to conserve a strain of Roman-British blood, the same tendency is observed. In New York, the vegetable and fruit trades both wholesale and retail are largely in the hands of Italians. "The Romans were farmers, and they loved farming."

All the vegetable products of Italy, susceptible of being cultivated in the colder climate of Britain were introduced into that country by the Romans. Cereals, fruits, edible vegetables, flax, and even flowers, were thus transplanted, or disseminated. The Romans brought into Britain the apple, pear, plum, peach, apricot, cherry, currant, gooseberry, and grape. The apple was grafted into the native costard, hence the modern term 'costermonger,' for an apple or fruit-vender. The walnut tree is indigenous to, and still grows wild in, Persia and

Afghanistan, whence, at about the beginning of our era, the Romans introduced it to Italy, and afterward to Gaul, from which country it was transplanted to Britain, and thus its fruit came to be called the gaul-nut or walnut. The Romans also introduced the willow, or box-tree.

When grape vines were introduced into Britain it was not permitted to cultivate them for the purpose of making wine, for fear that it might curtail the demand for the wines of Italy. An edict of Domitian on the subject is still preserved. A policy similar to this one was afterward pursued by the Spaniards in America. About the year 276 the Emperor Probus reversed this policy, by encouraging the planting of vines and making of wine in Britain.

Turnips, carrots, parsnips, cucumbers, radishes, onions, gourds, beets, cabbages, endive, lettuce, asparagus, beans, peas, mustard, parsley, and many other vetches and herbs, were planted by the Romans in Britain. Their gardens were filled with roses, lilies, heliotropes, and other sweet-scented flowers, excellent enough to be known and mentioned in Rome. Britain is also indebted to the same source for all its useful grasses, among others lucerne, the medica of the ancients, and the alfalfa of the Moors, Spaniards, and Americans. Its ancient name reveals its Oriental origin.

Agricultural fairs are often erroneously attributed to the medieval ages. As a matter of fact they were held in the remotest times. Fairs at Tyre and the articles sold in them are mentioned in Ezekiel, Chapter XXVII. The Egyptians, Etruscans, and Romans, both during the Commonwealth and Empire, all held fairs. Trajan, Hadrian, and Antoninus established annual fairs at Lyons and elsewhere. With the Romans, fairs were a religious institution, the profits of which were consecrated to the support of the temples, within whose grounds, and under whose auspices, weekly fairs were held every *nundinum*, or, as we would say, every Sabbath day. This day, which with us is one in seven, but with them was one in nine, was also called *feria* or fair day, and the days of the week were reckoned and named from it, as *prima feria*, *secunda feria*, and so forth. At the Roman fairs agricultural products, wares, and slaves were sold, servants were hired, leases were renewed, and numerous other important affairs negotiated.

THE GOLD YIELD OF VICTORIA.—Victoria can claim to be one of the richest gold-bearing countries in the world. From the time of the first gold discoveries, in 1851, to December 31, 1905, the amount of gold won amounted to 68,367,403 oz. gross, valued at £273,236,500. The yield of gold for the year 1905 was 810,050 oz. gross, or 747,166 oz. fine, worth £3,173,741. There was a decrease of 10,967 oz. as compared with 1904. Of the several gold-fields districts, Bendigo was first with 212,465 oz. Ballarat comes next with 145,331 oz. Beechworth was a good third with 133,587 oz. Castlemaine had 90,205, Maryborough 85,768, Gippsland 73,633, and Ararat and Stawell 23,651 oz. respectively. The official report of the Mines Department states that the largest increases in 1905, as compared with 1904, are those of Castlemaine and Beechworth districts, with 13,035 oz. and 11,002 oz. respectively, the improvement in each case being almost entirely due to dredge mining. In two other districts, Gippsland and Maryborough, there were also increases, in the former of 6,912 oz. and in the latter of 619 oz., over the yields of the previous year. In the three remaining districts there were decreases. Bendigo showed a decline of 30,415 oz.; Ballarat had 3,642 oz., and Ararat and Stawell 8,930 oz. less.

Decisions Relating to Mining.

Specially Reported for the MINING AND SCIENTIFIC PRESS.

A parol grant of mining privilege on lands is a mere license, and is revocable at will, and conveys no title to any ores not severed and reduced to possession before such revocation. The expenditures of moneys in mining under a parol license adds nothing to the grant.

McCullough v. Rains (Kans.), 89 Pac. 1,041. (April, '07.)

Where one mine-owner acquired a right to drive a tunnel through the mining claims of another, which divided the veins of such second person, such second person did not thereby acquire the right to use such tunnel to work his own veins, on the theory that the first person's condemnation had been made for a public use, there being neither allegation nor proof of necessity for such common use, nor that the second party could not proceed to condemn a right of way for a tunnel to be used for his own purpose.

Headrick v. Larson, 152 Fed. 93. (Feb. '07.)

Where the vendor had completely performed a contract for the purchase of an interest in certain mining claims and the purchaser had almost completely performed his part of the agreement, prior to his repudiation thereof, it was held that such performance was sufficient and effective to take the contract out of the statute of frauds.

Ferguson v. Blood, 152 Fed. 98. (March, '07.)

An agreement in a lease by which the lessee agreed to pay to the lessor a specified sum per annum for ore mined during the life of the lease, as a minimum royalty for the demised property, without reference to the quantity of ore actually mined, and providing that all rents and royalties agreed to be paid could be deemed and treated as rents reserved upon contract by the lessor, was held an absolute undertaking to pay the stipulated annual sum. And a clause providing that on failure of the lessee to make the payment of the royalties or to develop the property, it should become forfeited and utterly void, did not sufficiently manifest an intent that it should be optional with the lessee to develop the property and to pay the rent or not, as he might see fit, as the clause of forfeiture was intended for the benefit of the lessor.

Lawson v. Williamson (W. Va.) 57 S. E. 258. (April, '07.)

On appeal the Court refused to examine the evidence and determine as a matter of law that a miner was guilty of contributory negligence, or that he assumed the risk of the danger, where the evidence showed that the miner was injured while taking from the mine a load of coal, by reason of the sagging of a beam supporting the roof of the entry at a place known as a 'horseback,' where it was also shown that the entry at such horseback was dark, and that the only way anything could be seen was by means of artificial light, and where it was also shown that the miner was required to hold the loaded car back to prevent it from running on to the mules, and that he was required to look ahead to see that the track was clear of obstruction, although the evidence showed that he had been driving in the mine for three years and in the particular entry for two months, and that his duties required him to pass under the place where he was injured from fifteen to twenty times a day, and in the absence of any positive evidence that he had actual knowledge of the sag in the roof at such horseback.

Jones & Co. v. George (Ill.), 81 N. E. 4. (April, '07.)

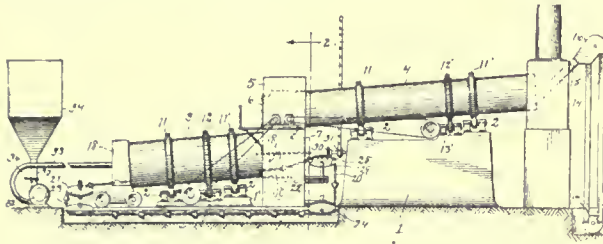
In an action for the death of a miner while descending into a mine, by reason of the breaking of the cable attached to the bucket in which he was being lowered, the question of whether the operator of the mine was negligent in furnishing a defective cable was for the jury to determine, and the determination of the jury that he was so negligent, would not be disturbed by the Court on appeal.

Owen v. Retsof Min. Co., 104 N. Y. S. 37. (May, '07.)

MINING AND METALLURGICAL PATENTS.

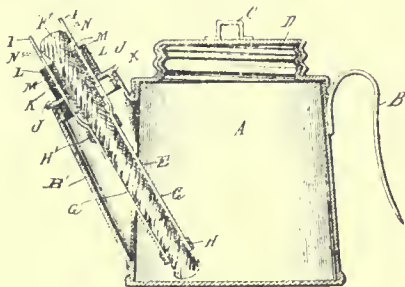
Specially reported for the MINING AND SCIENTIFIC PRESS.

APPARATUS FOR SINTERING FINE ORE.—No. 853,433; John G. Bergquist, Chicago, Ill., assignor to American Sintering Company, Chicago, Ill., a Corporation of Illinois.



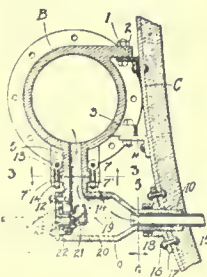
In a sintering furnace apparatus, the combination of an upper tubular furnace body section movably supported to rotate upon its longitudinal axis and inclined from the horizontal, a lower furnace body section having its receiving end arranged in proximity to, but offset below, the delivery end of the upper section and also movably mounted to rotate about its longitudinal axis and inclined from the horizontal, an upright housing within the upper part of which the delivery end of the upper section extends and within the lower part of which the receiving end of the lower section extends, a removable closure in the wall of said housing opposite the delivery end of the upper section and through which access to the latter may be had, and an inclined movable chute board extending across the interior of said housing from a point below the delivery end of the upper section to the lower side of the receiving section, and an opening in said housing opposite the receiving end of the lower section, through which access to the latter may be had when the chute board is moved.

MINER'S LAMP.—No. 853,078; Ralph L. Graves, Sumpter, Oregon.



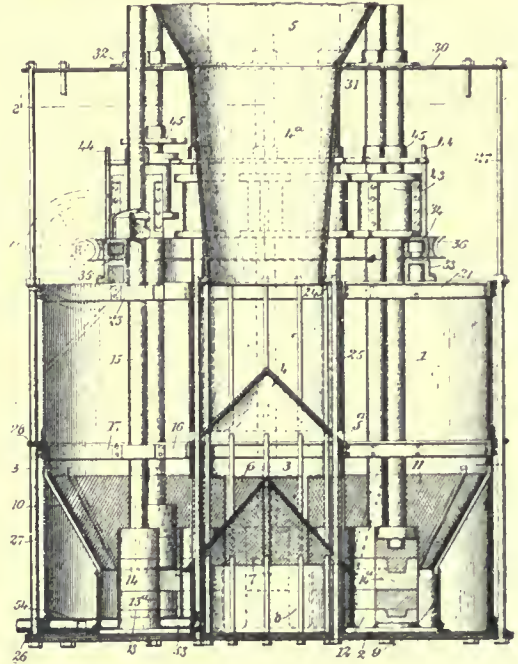
A wick tube constructed of a series of wires, collars adapted for holding the wires in circular arrangement, and a series of extension wires.

TUYERE CONSTRUCTION.—No. 849,539; Ulysses A. Garred, Anaconda, Mont., assignor to Charles H. Repath, Anaconda, Montana.



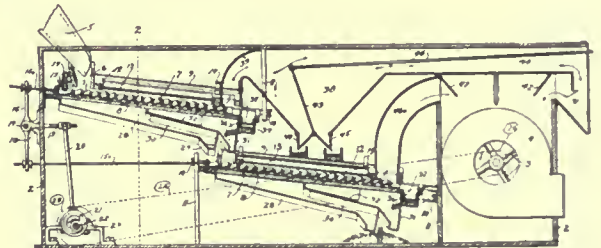
In combination with a wind-box having a series of terminally recessed flanges distributed along its outer walls, hollow necks connecting the flanges to the walls of the wind-box, ribs disposed in pairs on opposite sides of the recesses and extending from the flanges to the wall of the wind-box, tuyeres having correspondingly recessed flanges adapted to engage the flanges of the wind-box, and hinge-bolts suspended between each pair of ribs and passed through the recesses of the respective flanges.

STAMP-MILL.—No. 855,284; George Coon, Mount Vernon, Washington.



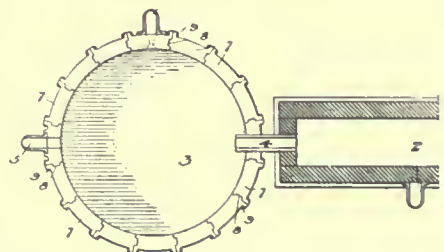
In a stamp-mill in combination, an outer tank, an inner tank disposed therein, a plurality of hammers disposed in said outer tank and surrounding said inner tank, a centrally disposed chute, a cone disposed within said inner tank and adapted to deflect ore falling thereupon toward said hammers, said inner tank having openings near said cone through which the said ore may pass.

ORE SEPARATING AND CONCENTRATING MACHINE.—No. 853,917; William P. Clifford, Iconium, and William W. Rankin, Ottumwa, Iowa.



An ore separating machine, consisting of a suitable frame provided with side and end walls, a laterally and longitudinally inclined supporting board or plate adjustably mounted therein, a slidably mounted shaker-plate mounted on said supporting-board or plate, an adjustably mounted plate secured above said shaker-plate and affording an air-passage, said supporting-board or plate being provided with an opening or passage at its side and end, inclined chutes mounted beneath said openings or slots, and means for operating said shaker-plate.

FOREHEARTH.—No. 856,616; Charles M. Allen, Lo Lo, Mont.; assignor to Ralph Baggeley, Pittsburg, Pennsylvania.



A forehearth having its walls of a size, weight, and mass that will produce and maintain an interior skull of chilled metal forming a heat non-conducting lining when the forehearth is charged and capable of retaining sufficient heat to prevent increase in the thickness of the skull.

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TABLE OF CONTENTS

Editorial:	Page.
Notes.....	31
The Study of Ore Deposits.....	32
General Mining News.....	35
Special Correspondence.....	40
London	Butte, Montana
Denver, Colorado	Mexico City
	Salt Lake, Utah
Concentrates.....	45
Discussion:	
A Question of Practical Mining.....	46
.....Francis A. Thomson	
Vacuum Silme-Fliters.....	46
.....A. G. Kirby	
Articles:	
A Tin Deposit Near Spokane.....	49
.....A. R. Whitman	
A Card System of Mine Accounts.....	50
.....R. S. Handy	
The Genesis of Ores.....	55
.....Horace V. Winchell	
The Leadville Downtown District.....	58
.....T. S. Austin	
Silver-Lead Smelting Practice—V.....	59
Making an Artesian Well Pump Itself.....	60
Spiral Feed for Tube-Mills.....	62
Ejectors as Liquid Elevators.....	62
Mining and Metallurgical Patents.....	61
Decisions Relating to Mining.....	60
The Prospector.....	60
Departments:	
Personal.....	34
Market Reports.....	34
Commercial Paragraphs.....	62
Trade Treatises.....	62

Editorial.

ELECTRICAL SMELTING OF IRON ORE is undergoing trial in California. During the past week a 25-ton smelter has commenced operations on the Pitt river in Shasta county. The Heroult process is being used and electricity is furnished by the Northern California Power Company, the president of which, Mr. H. H. Noble, is the moving spirit of this enterprise. The iron ore is a clean magnetite from a deposit situated on a ridge between the McCloud and Pitt rivers. The distinctive feature of this large-scale experiment is that the furnace is operating under a three-phase 60-cycle alternating current. In our next issue we shall publish a complete report of this important event.

NO BETTER APPOINTMENT could be made than that of Mr. Frank A. Leach to succeed Mr. George E. Roberts as Director of the United States Mint. Mr. Roberts becomes president of a bank at Chicago. Mr. Leach has been superintendent of the San Francisco Mint, where he exhibited unusual resourcefulness and loyalty at the time of the earthquake-fire. Apart from that episode, he has won a reputation as a faithful and efficient Federal officer. It is an appointment in which politics—especially our peculiarly dirty local kind of politics—play no part. We congratulate the administration at Washington in their choice and we wish Mr. Roberts a long and useful term of office.

THE peso is not a dollar, and the addition of the suffix Mex. to the latter is incorrect because the unit of coinage in Mexico is the peso. Much confusion has been caused by this misuse of terms, as all can testify that have had business south of the Rio Grande. Unfortunately the dollar sign is in general use but that for the peso is almost unknown, although it is employed in the Philippines. We intend to use it and have had the necessary type cast for us. When you see \$10 in this Journal you will know that is ten dollars and when you see P10 you will know that is ten pesos, that is, about half as much.

CARD SYSTEMS of accounts are a comparatively new feature of systematic mine management. They are being adopted, under various forms, at most American mines. It is likely that the detailed description given by Mr. R. S. Handy in this issue will be of immediate service to several managers. It is published with this purpose. We have previously published articles on this subject by Messrs. Walter S. Brown and Horace G. Nichols, besides one by Mr. Philip H. Argall on metallurgical accounts.

A STATEMENT is going the round of the non-technical press that a lake of quicksilver has been

discovered in the State of Vera Cruz, Mexico. We wrote to a distinguished Mexican geologist and he replies saying that he has just returned from the region specified. The whole thing is a yarn.

CABLE ADVICES state that dynamite outrages have occurred at Johannesburg as an incident in the strike of white miners. Attempts were made to destroy the shafts of the Cason and Modderfontein mines. This is serious, but we expect to see prompt arrests and swift punishment, for in these matters the Transvaal Government is likely to set a good example. No reign of terror, such as existed in Idaho and Colorado, will be permitted. The law is supreme because it has not been paralyzed by local politics.

MAIL ADVICES bring accounts of the further slump in Kaffirs—that is, South African mining shares—by reason of the attitude of the Transvaal Parliament, which is dominated by the Boer party. A motion condemning General Botha's policy was badly defeated and it is clear that the Chinese coolies will be repatriated when the existing contracts expire. There is a hope of Kaffirs being obtained to replace them, but this is vague. The mine managers realize that the brief era of Chinese cheap labor is fated to end abruptly and they set no store by the promised supply of Basutos, Kaffirs, and low-priced white men. The Boer policy evidently is to use the mines for the benefit of the country, and the people resident there; they refuse to consider the deposits of gold as being merely a means of enriching speculators in Europe. It is annoying to shareholders, but it is a selfishness not wholly unenlightened.

THE VAGARIES of promotion are varied. From New York come three recent examples. Thus, W. C. Greene got a timber concession for a song from the Mexican Government and sold half of it to the copper company of which he was president for \$1,250,000 with the further proviso that the copper company was to buy \$1,000,000 worth of lumber annually for 25 years. Grant Hugh Browne organizes the United Cobalt Exploration Co. to buy the Gillies Timber Limit, and when the Canadian Government refuses to sell it at his price, he invests the funds of the Exploration Company in purchasing other claims at Cobalt. He states that the money is not lost and that the vendors offered to refund it to the company. Another promoter has chartered a train to take speculators to Cobalt. It is to be a free trip, that is, you put up \$1,000 in cash before you start and this gives you the right to invest your money in 2,000 shares of stock. If your investigation does not prove the value of the mine, you will get your money back. Probably. On the return journey the train will stop at Niagara Falls and the shareholders will see some real water.

DIRECTORY OF DIRECTORS is the title of an annual guide-book giving a list of the leaders in corporate finance, together with their multifarious positions of supposed trust. William H. Newman is first

with 119 directorships as against 106 last year, and F. D. Underwood is second, being 80 times a director as compared to 72 a year ago. W. K. Vanderbilt is on 73 boards, E. V. Rossiter on 69, J. P. Morgan on 59, James Stillman on 57. Chauncey M. Depew, who was the champion multi-director two years ago, drawing fees from 73 companies in 1905, is now credited with only 64; and it is evident that he is no longer regarded as a respectable dummy. There are 12 men that serve as directors of more than 50 corporations. In contrast to these, John D. Rockefeller is a director of one company only. It is not necessary to emphasize the absurdity of the idea that a man can serve faithfully as a trustee in fifty enterprises nor to show the lack of conscience exhibited by men who accept so many responsibilities. In most cases the social engagements of these men occupy a noteworthy portion of their time, so that their attention to business affairs is necessarily limited. The 'Directory of Directors' may be considered as giving a list of the men that fail to recognize that a director is a trustee and not a figure-head with special privileges. John D. Rockefeller, bad citizen and chief pirate as he is, sets an example in his devotion to a single business and the only regret is that his work is so distinctively anti-social.

The Study of Ore Deposits.

THEORIES of ore deposition are always interesting to those engaged in mining; indeed, it is fair to say that as regards the attempt to explain occurrences of ore no one is so prone to theorize as the miner himself—the prospector, the drill-man, and the operator. Professors are popularly credited with dreaming scientific dreams, but it is a fact that you will hear more theories on ore deposition in a mining camp than in a class-room, and while it may not be wholly true that the freedom of conjecture increases with the scantiness of scientific observation, it is certain that the vitality of the discussion is intensified among those to whom such theories are no academic matter but a real guide to exploration. Among the unscientific the facility for theorizing is increased by the lack of knowledge; the constructive imagination that is untrained loves to be free from the brutal restraint of facts. For this reason the study of ore deposits has suffered; despite the intensity of modern mining, the depth attained geologically is insignificant; we theorize concerning the interior of the earth while ourselves on the outside, we are compelled to infer from imperfect data, so that those who are unwilling to advance slowly from point to point have confused the subject by a mass of unsupported hypotheses. The scientific man ignores most of it, he is unaware of a great deal of it, but the average engineer or operator engaged in mining encounters the undigested ideas of pseudo-science at every turn, in his daily paper, in the prospectus, in the stope. On the other hand the geologist himself, especially in England, where economic geology was long held to be tainted by commercialism, is responsible for the unsatisfactory treatment of a subject that is as interesting as it

is important. Geologists who were keen stratigraphers and physiographers have undertaken to discuss ore deposits without going underground in mines. To go there is to soil one's clothes and to submit to physical discomfort; to those unfamiliar with them the conditions are unfavorable to accurate observation. In consequence, we have had theories that were constructed out of the smoke of the scholar's pipe and we have been taught geology that was like the kingdom of heaven, which came not by observation. The science of ore deposits has suffered inevitably. Between the theorist who does not observe at first hand and the operator in contact with actualities who does not know how to reason logically, the accepted explanations of the manner in which orebodies were formed has swung from one extreme to another, from side to side, from the purely plutonic to the wholly aqueous, either giving all the credit to ascending or imputing the whole result to descending solutions, until the man that exploits the orebody had about decided that his chance of finding ore and his ability to extract it were not likely to be augmented by much thinking concerning the origin of such concentrations of mineral. The situation was saved by the mining engineer, who became a connecting link between the man in the daily contact with facts and the professor in constant touch with books. The facts and the books came together.

Of course, the big work of comprehensive study was still done, and is being done, by geologists specially trained for the purpose; the engineer became a hodge-carrier in the new house of science, bringing the bricks of ascertained fact to the philosopher, who laid them down in ordered sequence, so that a safe structure arose out of a disordered array of building material. The simile can be carried further, but we forbear. In America the organization of the Survey brought into existence a scientific corps the first purpose of which was to apply geology to the exploitation of mineral deposits and the chiefs of that organization themselves combined the qualities of the scientific student and the investigating engineer. To the aid of accurate topographical maps they added skill in the sifting of data, many, if not most, of which they obtained from mine managers and consulting engineers. Sometimes the acknowledgement was scanty, but in the main it was generously recorded. It is true that Mr. John A. Church once spoke of "the usual self-sufficiency of the officers of the United States Geological Survey," and it is a fact that in scientific controversies between engineers and officers of the Survey, the latter have been in the pulpit, as it were, so that the layman has been at a disadvantage, but even in this regard we mention the matter merely as a stage of development that is past. In the end the mining engineer became the willing scout for the scientific authority to whom he gave all his recorded observations, and in most cases the official geologist showed such appreciation that the co-operation was more than repaid. Nowhere in civilized countries are the mining engineers and the officers of the Government Survey on such pleasant terms as in America. Thus, the mining engineer has been an important factor in forwarding the study of ore de-

posits; if that study has become of immediate practical value to the miner it is largely because the mining engineer has collected a large mass of observations in the course of his daily work. These he has given to his more scientific comrade so that by the sifting and arranging of them the true teaching of facts might be formulated into a connected theory. And this explanation of progress in America is confirmed by a glance across the water, where the stratigraphical geologist and paleontologist is a scientist in high standing while the mining engineer is still regarded as something akin to an explorer or adventurer, a distant relative of the civil engineer and only respectable in spots, certainly the inferior of the army, navy, and reserve forces, not to mention the clergy and the people that do nothing, gracefully. The geologist is held to be loftily scientific, the mining man is basely commercial; they do not meet on the same plane; there is a social unconformity. Therefore the economic geology that is purely English is insignificant, and the study of ore deposits owes so little to the official English geologists that the sum of their contributions would scarcely be missed. What there is of it is painfully academic and as far from the actualities of mining as its authors have been aloof from observation underground. But here we trespass unduly on the courtesy of some of our readers, to whose knowledge of affairs, British and Colonial, we are willing to appeal. If we emphasize this side of the subject it is to urge the members of our profession to co-operate loyally with the men that make a special study of ore deposits, to the end that all the facts available may be gathered and placed in good hands. A vast number of useful observations are being made in the drift and in the stope every day; much of it is never recorded and soon forgotten. If every mining engineer did a little by way of contributing facts and notes, the mass of available information would be enormously increased. Some may be able to collect sufficient data for an article or treatise, but the majority have not the time or faculty for such work. But even the most busy or the least literary can put his notes together and send them either to the nearest specialist or to a technical journal. We are glad to record such notes. On another page will be found an address delivered by Mr. Horace V. Winchell, a mining geologist trained in a severe post-graduate school—that of mine litigation at Butte. We intend to discuss his suggestive remarks in our next issue, and at the same time we shall refer to the scholarly contribution made recently by Mr. George J. Bancroft to the Transactions of the American Institute of Mining Engineers. This mining engineer has obtained his training in the course of examining mines for commercial purposes; it is a training that emphasizes the utilitarian value of geology.

Ruskin was a rhapsodist and in his geological studies he disdained deposits of mineral, nevertheless he said a thing that is strictly germane to this matter: "There is but one thing worth saying, and that is what we have seen for ourselves." Let this be the motto of the mining engineer in geological discussion; it is the bedrock on which lies the gold of true theory.

Personal.

C. W. MERRILL is in San Francisco.

AUGUSTE MATHEZ is here from Denver.

H. VINCENT WALLACE is here from Nogales.

WILLIAM L. COBB is examining mines in Utah.

P. G. LIDNER has returned to New York from Bolivia.

E. N. VAN CORTLANDT is examining mines at Bingham.

COURTENAY DE KALB has returned from New York to Los Angeles.

CHARLES JANIN is examining mines in Routt county, Colorado.

JOHN A. REID is examining mines in Mariposa county, California.

F. J. H. MERRILL will arrive here from Sonora, Mexico, next week.

T. BRUCE MARRIOTT has returned to London from Buenos Ayres.

D. W. BRUNTON has returned to Denver from a journey around the world.

E. L. WHITE, of Denver, has been doing professional work at Leadville.

F. H. MORLEY, of Denver, has been making examinations near Bisbee, Arizona.

E. M. ROGERS has left New York to inspect mines in Idaho and Colorado.

S. F. SHAW is examining mines in the Ocampo district, of Chihuahua, Mexico.

MARK L. REQUA is examining manganese deposits in Colusa county, California.

FRANK H. PROBERT is in Scotland. He will return to Los Angeles in September.

CHARLES A. GREEN, of Mill City, Nevada, is in San Francisco to buy machinery.

JOHN M. NICOL has gone to Nicaragua, in the interest of the Joshua Hendy Iron Works.

FRANK W. OLDFIELD has gone to Los Angeles, on his way to mines in San Bernardino county.

JAS. C. H. FERGUSON, Pacific Coast representative of the Midvale Steel Co., has gone to Philadelphia.

W. C. BRACE, of Denver, was here on his way to the Daulton mine, in Madera county, California.

WALTER S. BROWN is at El Tiro, in Arizona. His partnership with E. S. Wiard has been dissolved.

R. W. MACFARLANE, manager for the Cherokee Goldfields, Ltd., is in England on a visit from Mexico.

FRANKLIN R. CARPENTER, of Denver, has gone on professional work to Newfoundland and Nova Scotia.

W. A. ALLEN is now superintendent of construction for the American Smelting & Refining Co. at Salt Lake City.

E. S. WIARD has returned to Denver from Mexico. The firm of Wiard & Brown has been dissolved by mutual consent.

FRANK G. WILLIS, of Hills & Willis, Cripple Creek, is spending a few weeks in Gunnison county on professional business.

B. A. BOSQUI, metallurgist with the Great Boulder Perseverance Mining Co., Kalgoorlie, has returned to San Francisco.

WALTER G. PERKINS remains at Ely. His resignation was not accepted by the Steptoe Valley Smelting & Mining Company.

ANGUS SUTHERLAND, formerly at Idaho Springs, Colo., has become superintendent at the Boston Consolidated mines at Bingham, Utah.

THE State Legislature has appropriated for the MICHIGAN COLLEGE OF MINES, at Houghton, \$43,000 for a new central heating and power plant, also \$75,000 for a library and museum building.

Latest Market Reports.

LOCAL METAL PRICES—July 11.

Antimony.....	17.50@20.00c	Quicksilver (flask).....	838@89 50
Copper.....	24 00@25.00c	Spelter.....	7.75@ 8.50c
Pig Lead.....	5.35@ 6.30c	Tin.....	43.00@44.50c

ANGLO-AMERICAN SHARES.

Cabled from London.

	July 3.	July 11.
	£ s. d.	£ s. d.
Camp Bird.....	1 1 6	1 1 9
El Oro.....	1 8 9	1 8 9
Esperanza.....	2 0 9	2 1 6
Dolores.....	1 7 6	1 5 0
Oroville Dredging.....	0 16 3	0 16 9
Stratton's Independence.....	0 3 0	0 3 0
Tomboy.....	1 11 3	1 11 3

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.

Date	Electrolytic Copper	Lead	Spelter	Silver
July 5.....	22	5½	6.13	67½
" 6.....	22	5½	6.23	67½
" 7.....	Sunday. No market.			
" 8.....	22	5½	6.23	67½
" 9.....	21½	5½	6.18	67½
" 10.....	21½	5½	6.18	67½
" 11.....	21½	5½	6.18	67½

SOUTHERN NEVADA STOCKS.

San Francisco, July 11.

Atlanta.....	\$ 57	Laguna.....	1.30
Belmont.....	3.50	Little Tonopah.....	2.50
Columbia Mtn.....	54	Manhattan Con.....	50
Combination Fraction.....	2.80	Midway.....	1.20
Daisy.....	1.90	Mizpah Extension.....	
Fairview Eagle.....	60	Mohawk.....	15.00
Florence.....	4.70	Montana Tonopah.....	3.20
Gold Bar (Bullfrog).....	67	Nevada Hills.....	6.00
Gold Bar (Goldfield).....	50	Red Top.....	4.25
Goldfield Con.....	8.10	Sandstorm.....	43
Goldfield of Nevada.....	1.40	Silver Pick.....	62
Gold Kewanas.....	85	St. Ives.....	1.00
Great Bend.....	63	Tonopah Extension.....	1.70
Jim Butler.....	1.07	Tonopah of Nevada.....	13.25
Jumbo.....	4.00	Tramp Con.....	48
Jumbo Extension.....	1.75	West End.....	90

(By courtesy of W. C. Ralston, 368 Bush St.)

COPPER SHARES — BOSTON.

Closing prices.

Closing prices.

Name of company.	July 11.	Name of company.	July 11.
Adventure.....	24	Michigan.....	14½
Ahmeek.....	70	Mohawk.....	82
Allouez.....	45	Nevada Con.....	14
Analgamated.....	83½	North Butte.....	83
Areadian.....	6½	Old Dominion.....	45½
Atlantic.....	13¾	Oscoda.....	127
Balaklala.....	9½	Parrot.....	20½
Bingham Con.....	15	Phoenix.....	1½
Boston Con.....	26½	Quincy.....	117
Butte Coalition.....	25	Raven.....	
Calumet & Arizona.....	165	Rhode Island.....	5½
Calumet & Hecla.....	825	Santa Fe.....	3¼
Centennial.....	29½	Shannon.....	175½
Con. Mercur.....	38	Superior & Pittsburg.....	17
Copper Range.....	79½	Tamarack.....	107
Daly-West.....	16	Trinity.....	22¾
Franklin.....		United Copper com.....	63¼
Granby.....	125	Utah Copper.....	51
Greene-Canaan, etc.....	16½	Victoria.....	7½
Isle Royal.....	19	Winona.....	8
Mass.....	5	Wolverine.....	160

(By courtesy of E. F. Hutton & Co., 490 California St.)

COMSTOCK SHARES SAN FRANCISCO.

Closing Prices.

Closing Prices.

	July 10.		July 10.
Alpha.....	03	Julia.....	05
Andes.....	17	Kentuck.....	10
Belcher.....	25	Mexican.....	38
Best & Belcher.....	55	North Gould & Curry.....	
Bullion.....	17	Occidental.....	38
Calcedonia.....	15	Ophir.....	1.75
Challenge Con.....	10	Overman.....	09
Chollar.....	08	Savage.....	6
Confidence.....	61	Scorpion.....	06
Con. Virginia.....	60	Sierra Nevada.....	35
Crown Point.....	16	Silver Hill.....	60
Exchequer.....	35	Standard Con.....	
Gould & Curry.....	13	Union Con.....	96
Hale & Norcross.....	50	Yellow Jacket.....	1.00

General Mining News.

ALASKA.

Another tunnel project is being considered for Silver Bow basin. The Alaska-Penn. M. Co. has recently secured control of the Rae group, where a tunnel is planned for a depth of 1,200 ft. to connect with the apex of the lode by a 1,000-ft. raise. A compressor will be installed and the tunnel driven by contract. This mineral belt includes the Ebner, Hallum, Alaska-Juneau, Perseverance, Alaska-Penn., and other properties.

ARIZONA.

COCHISE COUNTY.

Four furnaces ran continuously during June, at the Calumet & Arizona smelter, and the output was about 4,000,000 lb. copper. The new machine-shops are completed, and

will be increased to 3,500,000 lb. copper. Men are grading for a new dust-chamber and stack, to be completed before the sixth furnace is installed.—The Arizona Commercial company is again shipping 200 tons per day from the Copper Hill mine, while at the Black Hawk mine a sump is being cut at the 500-ft. level.—The Great Eastern shaft of the Superior & Boston is down 220 ft., the Limestone shaft is 130 ft. deep, and the winze 35 ft.—The Inspiration company has received returns from 15 tons of concentrate shipped to the Old Dominion smelter, the consignment netting \$1,863. J. D. Coplen is the manager.—Shipments of 80 tons are coming daily to the Old Dominion from the Gibson mine. Ore running 25% is being mined in the Pasquale tunnel.

PINAL COUNTY.

The Newbury company has purchased three 100-h.p. boilers, with engines and dynamos, for an electric power-plant to be built on the Gila river, 16 miles east of Florence, near the old Butte smelter site. A 19-drill compressor has been ordered and an electric pump and hoist will be installed at the Newbury mines. An aerial tram will be built from the mines to the railroad, where ore-bins will be constructed. C. M. Schofield is the superintendent.

The old Vekol mine, 30 miles south of Casa Grande, is to be worked again by a new company incorporated by S. J. and E. S. Garrett, and W. H. Forebach. They are also operating the Copperosity property, which lies in the same limestone belt.

YAVAPAI COUNTY.

The Dillon tunnel of the Hull Copper Co. is in over 2,000 ft., and as soon as connection is made with the 1,888 shaft, cross-cutting will be started at several points in the tunnel. This shaft is 450 ft. deep, and there is a drift from the 450-ft. station, but the workings are full of water to within 150 ft. of the surface.

CALIFORNIA.

AMADOR COUNTY.

The Sutter Creek Gold Co., operating about eight miles south of Sutter Creek, has started up the new concentrators. A cross-cut is being run from the 200-ft. level. Sidney Drake is the manager and Jack Hall the superintendent.

BUTTE COUNTY.

It is reported that the Butte Star mine has been sold by E. C. Wilson and others, to Pennsylvania capitalists. A good deal of interest is being taken in the deep river channels along the Magalla ridge. The Mammoth Channel G. M. Co. is preparing for development work, and the rich channel has been struck on the J. B. Steifer Mining Co.'s ground.

EL DORADO COUNTY.

Work continues steadily at the Beattie, Pacific, Golden State, Magnolia, Crane's Gulch, and Gold Bug mines near Georgetown, but no strikes of unusual importance have been reported.—The cross-cut in the Neptune should cut the vein in a few feet.—The mill at the Vivian mine is nearly finished and the machinery is being put in place.—At the Alpine mine, work has stopped, pending the expiration of the Wingfield option, but the pumps are running continuously and the mine is free from water.—A good dump of pay-dirt has been accumulated at the Cooley mine by Brazil Gigax & Co., and the sluices are nearly completed.—A carload of machinery from the Walker mine in Old Diggings, Shasta county, has been shipped to Georgetown and will be installed at the Idlewild, or Taylor mine, by the Thompson Brothers, who have a lease on the property. The mine will be unwatered to the 200-ft. level, from which point work will proceed north of the shaft.—Fountain & Buehler have found good gravel in the main tunnel of the Trimble mine.

The Round-Out mine, in the Blairs district, owned by Richards & Fairchild, has been sold to the Nevada men who are operating the Pilot Knob mine. Grant S. Estey is in charge. About 200 ft. of tunnel will be driven before gravel is reached.—W. I. Smart is moving the machinery and buildings from the Delwisch mine to the Gravel Hill property. More men will be put on as soon as the mill is completed.



Southeastern Arizona.

the structural-steel framework for the new power-house is nearly all in place. This new power-house will be double the size of the old one. A new 500-ton furnace has been planned and material for it has already arrived. Each of the four old furnaces will be increased in size from 300 to 500 tons daily capacity, making 3,000 tons daily capacity for the plant.

GILA COUNTY.

Much work has been done in the Old Dominion during the past month. No. 3 sulphide vein has not yet been reached by any of the cross-cuts on the fourteenth level, but it has on the thirteenth and was found to carry good ore. A drift being run west on No. 3 vein, thirteenth level, has been in 20% copper ore for some distance, the orebody averaging 10 ft. wide. The double-compartment winze is sunk 50 ft. below the fourteenth level. The new furnace will be blown in this week, and the monthly production

MONO COUNTY.

A road is being built from Calavada to the True Friend property. The gasoline hoist for this property is at Minden, and will soon be erected.—About 20 men are doing development work on the Pittsburg-Liberty claim. Weltfle & Eastwood have let a contract to Foley & Morgan, to sink a shaft on their lease on the Pittsburg-Liberty.

NEVADA COUNTY.

Operations will be resumed at once on the Birchville mine, near Graniteville. The pumping plant will be enlarged and the incline shaft, now down 400 ft., will be sunk deeper. Fred Medlin is in charge of the work.—The North Star Mines Co. has just paid a dividend of 20c. per share, amounting to \$50,000. The quarterly statement of the affairs of the company has just been issued.—L. C. Heler, who is developing a vein of antimony ore on the Johnson ranch, south of Grass Valley, reports encouraging showings.—A blind vein has been uncovered in the Marcotte, near the Ethel mine.—A strike has been made in the Mountain View, near Washington, and good progress is being made on the Arctic.—E. E. House will have charge of the Morning Star mine at Badger Hill, near Patterson, in the Cherokee district.

The Golden State M. & D. Co. has been incorporated to work the Ozall & Shelby mine in the Chicago Park district. A 10-stamp mill will be installed. Three tunnels have been run to prospect the ground.—Driving continues on the 1,400-ft. level of the Canada Hill mine, and a station will be cut on the 1,500-ft. level.—On account of the State law which imposes a license tax upon all corporations, 11 mining companies in this county have reduced their capital stock. The law graduates the tax according to the amount of capital stock, so large capitalization will probably not be as popular as heretofore.

The Oustomah mine on West hill has been sold to E. A. and J. O. Hayes of San Jose, who were represented in the deal by Frank B. Everett. The hoisting and pumping plants will be enlarged and the incline shaft that is down 900 ft. will be sunk and the property thoroughly developed. There is a 10-stamp mill on the Oustamah and a 3-stamp mill on the Eddy, which goes with the other property. The Oustamah, which is only one-half mile west of Nevada City, has been owned by the Morgan family. It was operated in the sixties and was formerly known as the Pennsylvania.

SAN BERNARDINO COUNTY.

The Orange Blossom M. & M. Co. will erect a stamp-mill upon its property, 10 miles north of Bagdad. Water will be pumped from Budweiser springs. The mill will be equipped with Nissen stamps, will have a capacity of 50 tons per day, and will be in operation by October 1.—H. M. Glidden, of Spokane, has taken an option on a group of 10 claims on the Mohave desert near Amboy, and \$35,000 has been paid, to apply on the purchase price.

SHASTA COUNTY.

(Special Correspondence).—The iron smelter erected to treat the high-grade iron ores near Baird by the Heroult electric process is completed. The preliminary heating of the furnace for drying the lining is finished, and arrangements are being made to commence smelting this week. The railroad is being graded within a mile of the smelter, and it is expected that communication with the Southern Pacific will be completed in a few months.—A discovery of rich copper ore within a few feet of the surface, west of Shasta, has recently attracted considerable attention. This find, being made beyond the southern extremity of the known copper belt, is encouraging prospectors to develop the shear-zones in the district, which carry small quantities of copper, which may prove amenable to concentration.—At the Yankee John mine, near Centerville, rich ore has been struck at the 75-ft. level. Specimen rock assaying about \$5,000 per ton is being shipped. The workings are now below the oxidized zone, and the prospects in depth are excellent. The shaft is the deepest in the district, and sinking will be continued. The ore occurs in a number of

veins with quartz and calcite. The country rock is slate with andesite intrusions.

Redding, July 1.

The new electric hoist at the Gold Leaf mine, near Shasta, is in operation and the raise from the tunnel to the surface, 120 ft., has been finished. H. O. Cummins is the manager.—A new gasoline hoist has been installed in the Gambrinus mine, near Whiskytown, at the end of a 500-ft. tunnel, where it will hoist from the winze.—The furnace of the Great Western Gold Co.'s smelter at Ingot has been blown in, after a short shut-down. J. S. Henderson is the president and S. E. Bretherton the manager.—J. C. Rhodes has resigned the superintendency of the Donkey mine.

SISKIYOU COUNTY.

George Kradle is superintendent of the Blue Nose mine.—A fine body of ore has been opened in the west drift of the Russell, Sheffield, & Callahan mine.—The Sisson E. & M. Co. will develop the Home group of mines, two miles west of Sisson. Fred Zimmerman is in charge.—The Morrison-Carllock shaft has been repaired and a full crew is again at work.—John Quigley has completed 900 ft. of work in his tunnel on Indian creek.—Noel E. Graves, superintendent of the Sheba mine, reports that he will have the mill going within a week.—John O. Harrison has got an extension for one year of his option on the Race Track placer property, which is a continuation of the Blue Gravel mine, one mile south of Yreka.—The French company, which operated on South Fork and Wildcat creeks, has resumed operations, and the giants will be started under the direction of Fred Beaudry.—At a recent meeting of the directors of the Headwaters G. M. & M. Co., in New York, it was decided to continue the development of its property on Humbug creek. John E. McBride is the managing director.—The first load of machinery for the new link-belt dredge for Callahan has arrived, and the old dredge is being dismantled. The power-house of the company is being changed from a direct to an alternating-current system.

The new steam scraper used by the Los Angeles Co., on Klamath river below the Quigley ranch, is working satisfactorily.—The construction of the California-Northeastern railroad from Weed, through the mountains between Grass lake and Butte creek will open some good country to prospectors.—The Nordheimer mine on the Salmon river has been sold to Palo Alto and Los Angeles parties. This property has been a producer for 20 years. The same people have purchased the Markusen mine, which will be in charge of J. L. Fehely.—A good many men are at work on prospects near Happy Camp.—The Dick Johnston quartz mine will be operated by G. W. Addison.—The Blue Nose mine has been closed, but work will be resumed in September, when a cyanide mill will be built.—J. M. Morrison, formerly one of the owners of the Morrison-Carllock mine in Quartz valley, has bought the Snook & Burns property of 160 acres, in Plowman valley, and will develop it.—The Blue Gravel lease which has been in existence for 15 years, has expired, but the ground will probably be taken over by a new company.—L. C. Trent is working 15 men in the cross-cut at Mineland.—J. L. Welker is working the Lehigh claim in Volcano canyon. This is a tailing-claim that has been fed for years by the gravel from the Paragon.—Rich gravel has been struck in the McGeachem mine east of Iowa Hill. This ground adjoins the Jupiter, and Elmer Rose is the manager.—Some good ore has been taken out of the Louise vein by Dugald Duncan.—A number of *arrastres* will be put in at the Clipper property this summer. This mine is an extension of the Wise vein on the north fork of the American river.—At the Hidden Treasure, 45 men are working. The tunnel has been driven for 1,200 ft. through the reef of rock about 8,000 ft. of old river-bed remains to be worked.

H. R. Patterson has taken over the Spencer quartz mine on Humbug creek. It is estimated that there is ore worth about \$50,000 on the dumps, and this will be cyanided. Work will commence at once.—S. V. Davidor, who bought the McKinley mine, on Humbug creek, has incorporated the property under the name of the Champion

Group M. Co.—The water supply is becoming very low among the camps of this county.

TRINITY COUNTY.

The Keating group of claims, on Hardscrabble creek, has been bonded to Oakland parties for \$40,000.—The giants at the Union Hill mine have sluiced off the overburden and struck some rich gravel-pockets in the banks. No clean-up has been made, and hydraulicking is carried on continuously, as the water supply is running a little short. About 15 men are employed at the property.

One giant is running continuously at the Union Hill mine, near Douglas City. The Sugar Loaf hill gravel, and that in the lower mine, are being sluiced. The supply of water is decreasing, and will only last one more month, but a new reservoir will soon be completed, which will give more storage room for next season. C. E. Goodyear is the superintendent and H. E. Crowell the manager, and 18 men are employed.—A covered tramway is being built at the Bullychoop mine, to prevent snow from interfering with the mill-supply during the winter. About 50 men are employed and 20 stamps are dropping.

TUOLUMNE COUNTY.

T. H. Bluett and J. A. Gillis have finished unwatering the Kapp & Jardine shaft on Jackass hill, near Tuttletown. A suction ventilator is in operation and they are sinking the shaft from the 225-ft. point.

A number of mining men at Groveland have organized the Southern Tuolumne Miners Association with A. P. Dron, president, and H. S. Richardson, secretary-treasurer. Mine owners, operators, and managers are eligible to membership and over 30 men are charter members.—A cross-cut has been started at the 100-ft. level of the Lion mine.—The Imperial Gold Mining Co., operating on Kanaka creek, will begin erecting a 10-stamp mill about August first.

COLORADO.

TELLER COUNTY.

(Special Correspondence).—The Gold Sovereign has recently encountered a four-foot vein of 12 oz. silver and 6 oz. gold ore in the 1,200-ft. level and is shipping regularly. Some ore is being broken in the No. 3 shaft that averages 6 to 8 oz. mill run. They recently opened a good-sized shoot north of the main shaft that had never been opened before. A portion of the property is under lease. Abram Rapp is the manager.—Adjoining the Gold Sovereign on the western slope of Bull hill is the property of the Trilby Mines Co., for which James T. Stewart is manager. The shaft on this property is down 860 ft. and it is producing about 50 tons of shipping ore per day which runs from \$25 to \$50 per ton. The property is equipped with an Ottumwa Iron Works hoist and eight-drill compressor made by the Chicago Pneumatic Tool Co. L. K. Mearkle, of Pittsburg, is the president.—The Vindicator Con. Gold M. Co. is shipping about 2,000 tons per month from both the Vindicator and the Hull City placer, which is now under the control of the Vindicator company. The company owns about 40 acres. Exhaustive tests were made some time ago which seemed to be satisfactory, but before concentrating for a mill to handle the low-grade material and dumps of the mine they have decided to make more tests, and as a consequence F. J. Nagel, recently with the New York & Honduras Rosario Mining Co. is putting the plant in the old Lillie shaft-house in shape to make the tests for the company. If these tests are satisfactory it is expected a larger plant will be erected. The shipping ore is put through three different washers, and as a consequence about five cars of \$60 ore is saved per month. The Vindicator shaft is down 1,200 ft. and the Hull City shaft 1,262 ft. It is understood the drainage tunnel which is being driven will drain their ground to the 2,100-ft. level. F. J. Campbell is general manager.

Cripple Creek, June 22.

NEVADA.

CHURCHILL COUNTY.

(Special Correspondence).—The Spider-Wasp company is sinking a double-compartment shaft. The new hoist is

expected to arrive soon. A little good ore is blocked out. Two of the lessees are working in ore, and the others are in promising ground. A bunkhouse and blacksmith shop have been erected.—At the Wonder-Central the vein is showing up well, and development is under way.—A strike has been made in the tunnel of the Nevada-Wonder, some of the ore assaying \$324 per ton. Gold predominates, and the vein is several feet wide. Over 300 sacks have been filled with ore since the last shipment.—The Nevada Dixie G. M. Co. has secured a group of claims in Dixie valley, 35 miles north of Wonder. In places the vein is 25 ft. wide. The rich strikes in Dixie have caused a rush from this camp.

Wonder, June 27.

ESMERALDA COUNTY.

(Special Correspondence).—The Nevada-Goldfield Reduction Works treated 1,511 tons of ore last week from the following properties: Little Florence, 368 tons; Mohawk-Combination, 294; Ish-Sheets lease, 192; Reitz, 129; Mohawk-Jumbo lease, 118; McNaughton lease, 92; Con-



Part of Nevada.

solidated, 90; Loftus & Davis lease, 66; Red Top, 64; Codd lease, St. Ives, 42; Combination Fraction, 40; and Higginson lease, 16 tons. This does not include the ore handled at the Combination mill or the railroad shipments. The total production was approximately 3,200 tons.—A rich strike has been made in the 100-ft. level in the Florence. The vein is four feet wide.—The shaft on the Higginson lease is being sunk 50 ft. deeper. The vein at the 230-ft. level is three feet wide and runs well. The lease is on the Wedge claim of the Jumbo Extension.—The Kalfus and Ish-Sheets leases have been consolidated. The Kalfus lease is on the Mohawk, the Ish-Sheets on the Combination. Most of the work will be done through the incline shaft on the Ish-Sheets. The lease runs six months.—The Consolidated Mines Co. has secured a one-fourth interest in the Vinegarone claim, lying between the Red Top and Laguna.—The shaft at the Red Top Fraction is down 190 ft., and will be put down to 300 ft. A good strike has been made in the 172-ft. level, some ore running \$200 per ton. A station will be cut at the 200-ft. level and cross-cuts driven.—The Curtis lease on the Jumbo Extension has passed into the hands of the Frances-Mohawk company for \$50,000. A rich strike has been made on the 315-ft. level. D. McKenzie is directing operations.—Good ore has been encountered on the 218 and 250-ft. levels in the Mohawk-Florence.—The Gold Bar shaft is down 260 ft., and much development is under way. Two leases are operating.—The Golden Crown L. Co. on the Silver Pick has the shaft down 175 ft. At the 140-ft. level a small shoot of ore was found.—The Frances Mohawk Co. has struck a rich lode of sulphide ore on the Wedge, a fractional claim adjoining the Mohawk. Goldfield, July 5.

HUMBOLDT COUNTY.

(Special Correspondence).—Rosebud is growing rapidly, and daily trips are made by stage to Winnemucca, Mill City, and Humboldt. Miners are receiving \$4, \$4.50, and \$5 per eight-hour shift. Lumber is selling for \$90 per thousand feet.—At the Brown Palace, ore is being taken from the bottom of the 70-ft. shaft, and is sacked for shipment. Two cross-cut tunnels are being driven to cut two veins, and some good ore has been encountered. Alline Case is the superintendent.—Two shafts and a 325-ft. tunnel on the Golden Anchor have exposed good ore, and a drift and cross-cut are being driven to open up the vein. Silver predominates in the ore.—At the White Alps, a four-foot vein has been struck in the cross-cut from the 50-ft. shaft. In the tunnel that is being driven northeast of the shaft, ore running over \$100 per ton has been found.—At the Big Six, ore running \$122 per ton in silver and gold is being extracted.—In the Durango Girl, development is steadily progressing. The vein is of fair size, and has been traced over 2,000 ft.—Sinking has been resumed at the Dreamland, and the shaft will be put down to the 200-ft. level. A large vein running \$25 per ton lies in the bottom of the shaft. Promising ore has been found in the drift.—The Rosebud M. & L. Co. has secured leases on the Brown Palace and White Alps, and is putting a large force of men to work. A royalty of 25% will be paid the owners on ore running \$50 and over. The Rosebud Central M. Co. has secured five claims at this point, and is preparing to put men to developing its holdings.—Development work is under way on the claims held by the Nevada Rosebud Con. M. Co., and a tunnel is being driven on a promising vein. The claims are near the Brown Palace, Golden Anchor, and White Alps.—Excellent ore has been found on the Look-out claim of the Rosebud-Rattler M. Co. The vein is several feet wide, with some ore running \$40 per ton.

Rosebud, June 26.

NYE COUNTY.

(Special Correspondence).—A contract has been let for the construction of a 10-stamp mill for the Gold Bar Co. Grading for the site has commenced and the pipe-line from Mud Springs is being laid. The shaft is down 460 ft. and will go down to 1,000 ft. A station has been cut at the 450-ft. level.—The \$300,000 plant at the Montgomery-Shoshone is being rapidly constructed by the Traylor Engineering Co. Developments at the mine are progressing, and ore is being blocked out.—Another rich orebody has been discovered in the north cross-cut on the West Extension. The vein is of fair size and contains free gold. The strike is one of the richest yet made in the mine.—The Lost Burro group has been bonded by Julius Lemle and associates of Beatty for \$45,000. A force of men is at work.—The Ubehebe M. & S. Co. announces its intention to erect a smelter at Ubehebe at an early date. It is planning to construct a railroad from the camp to Thorps Well on the Goldfield-Bullfrog road. The company owns 50 claims in the Ubehebe district.—An English company is negotiating for the Homestake-King property. The mine is being sampled.

Bullfrog, July 3.

(Special Correspondence).—The shaft on the Great Western is down 150 ft. Two veins have been traced several hundred feet. Assays of \$12 per ton have been secured.—On the April Fool, some ore has been found, but the development has not been extensive.—Excellent ore has been found in the Lime Point, which was recently acquired by the Ish brothers.—At the Bonnie Claire recent developments have opened up a vein, and some high-grade quartz is being extracted.—Developments at the Wyman-Vyck are proving the property a valuable one. The shaft is being sunk.—The second power-line of the Nevada-California Co. insures the operation of local properties throughout the year. The first line was inadequate for this purpose.

Lida, July 2.

WASHINGTON.

CHELAN COUNTY.

(Special Correspondence).—E. J. Forman, of Seattle, has taken a bond from Kingman & Pershall for \$20,000 on the claims on Chelan butte, paying \$2,000 down, the balance to

be paid in installments, and the vendors to reserve 1,600 lb. of ore already sacked, and valued at \$1.25 per pound. The claims have not been developed over 13 ft. in depth.

Republic, July 5.

FERRY COUNTY.

(Special Correspondence).—The question of finding copper of economic value on Belcher Mtn., about 12 miles northeasterly from Republic, is one of interest to the mining men of this district. From the Copper Key mine, about 40 ft. below the surface, nearly 3,000 tons of iron oxide ore were stoped and shipped to the smelter. The stope is 90 ft. long, 45 ft. wide at the north end and 23 ft. wide at the south end. The ore contained no copper, but paid a profit out of the gold contents and excess of iron. The course of the stope was north and south. A winze was sunk 60 ft., and the trend of the vein became a matter of doubt. A cross-cut adit, known as the No. 2, was driven, but no ore was found on that level where it was expected. A survey was made, and a raise was run 40 ft., leaning slightly southward, and connected with the incline. From the top of the raise a cross-cut was driven 40 ft. in a southerly direction through a mass of iron oxide and sulphide, which pitches southeasterly and strikes northeast-southwest, a decided change from the course of the deposit in the upper workings. The ore extracted in cross-cutting assays 0.5% copper and \$6.19 gold per ton. From the No. 2 adit a cross-cut was driven southerly 43 ft. to the foot-wall and thence 31 ft. across a body of iron sulphide and magnetite, but not far enough to strike the hanging wall. In the lower cross-cut a stratum of somewhat silicious ore, 2½ ft. wide, was encountered, which assayed 2½% copper, and samples from the ore on either side showed some gold and silver. On this level the depth on the pitch of the vein is 245 ft. and the vertical depth about 200 ft. It is probable that exploration will be resumed from the No. 3 adit, the deepest opening in the mine, with a view to connecting with the orebodies above.—The Colville M. & S. Co. has traced the cropping of a silver-lead vein on the North Half group 350 ft. and driven an open-cut 20 ft. across a vertical vein of galena and carbonate of lead.—The Bortle Copper-Gold Co. has driven from its main working shaft 104 ft. north, into the ground of the Belcher Mining Co., at a depth of 60 ft. Another drift has been started in the opposite direction.—The British Columbia Copper Co., since it bonded the Lone Star and Washington claims in this county, has opened about 1,200 ft. of drifts, cross-cuts, and raises in 10 months. The work was started by cross-cutting the vein with an adit and afterward driving and raising on it. Bunches of ore assayed as high as \$50 per ton, but the ore ordinarily assays from \$15 to \$25 per ton in copper and gold, the former having the most value. The vein, which is rather flat, is from 40 to 70 ft. wide. The raises of 50, 80, and 100 ft. respectively, are in shipping ore, and the mine is developing so well that the company has decided to take up the bond. The ore goes to the company's smelter, at Greenwood, B. C.—The Amalgamated Republic Mines Co. has been incorporated under the laws of Arizona, to operate and purchase under bond and lease the Republic, Pearl Consolidated, Quilp, North San Poil, Trade Dollar, Midget, and Ben Hur mines, in Republic. The capital stock is \$2,000,000, of a par value of \$5 each. This company has taken over the options secured last February by Harry L. Rogers and negotiated for the purchase of the dismantled mill buildings of the Republic Power & Cyaniding Co. It is announced that J. C. Beideliman, the inventor of the new process for treating the ores of Republic camp, will have the management of the mines and mill, and that special machinery has been ordered. It is expected to treat the ores of the camp for \$2 to \$3 per ton. The articles of incorporation were to be filed by the company with the Washington Secretary of State, who is reported by the newspapers as having refused to file them, on the ground that one object of the company is to buy real estate in Washington, which is not legally permissible for a foreign company in this State. Lawyers are of opinion that a company organized under the laws of any State in the Union is not a foreign corporation within the meaning of the Act passed upon by the Secretary of State.

Republic, July 3.

STEVENS COUNTY.

(Special Correspondence).—G. H. Walters, Frank P. Milcark, and J. A. Maicli, of Spokane, have incorporated the Viking Copper Co., to develop a group of three claims in the Pierre Lake district. The property is half a mile from the railroad, and shipments will soon begin, the company having been guaranteed a freight and treatment rate of \$3.50 per ton.—An eight-foot vein of ore has been discovered at the surface on the Nellie S. mine, near Chewelah. The ore from the bottom of a 15-ft. prospect shaft assays \$34 per ton. It occurs in a contact between granite and lime. The mine is owned by Fred R. Clark and Phillip N. Clark, of Spokane, and is being developed under the direction of Conrad Wolfe, president of the United Copper Mining Co. The vein found by Mr. Wolfe is 200 ft. west of the main shaft, which has been sunk to the 200-ft. level on a four-foot vein. A cross-cut will run from the bottom of the 200-ft. shaft to get the west vein. It is thought, on account of the decided dip of the vein, that 125 ft. of cross-cutting will reach it. Machine-drills are installed at the property. Ore is being shipped from the 100-ft. level.—The suit of the Roselle Mining Co. of Spokane, against the Krupp Fire Arms Co. of Germany, to recover title to the mining property in Stevens county, was decided by Judge E. H. Sullivan in favor of the plaintiffs. The suit has been pending several months at Colville, and the property involved is valued at several hundred thousand dollars. It is situated in Cedar canyon and contains deposits of tungsten. The Roselle company is a close corporation, the stock of which is owned largely by Spokane people. The Krupp interests took possession of the property after it had been patented by the Roselle company, their claim being that they had purchased it from a former owner.—W. L. Wakely, of Spokane, has found several pockets of molybdenum in the northeastern part of Stevens county, where development work will be pushed.—Probably the richest strike of ore in the Metaline district, north of Spokane, has just been declared on the Flussie group of the Pend d'Oreille river. It carries lead, gold, and silver, a picked sample showing 74% lead, \$92 gold, and an ounce of silver. The vein is 50 in. wide and 90 ft. long. S. H. Anschell, one of the owners of the group, says that extensive work is being done at the Mammoth, Morning, Flussie, Diamond R., Bella May, Blue Bucket, Lead King, the Clark group of 41 claims on Flume creek, and the 54 claims of the Sterling Silver-Lead company.—The property has been opened to a depth of 100 ft. The mine was located in September, 1905, and covers 255 acres. The Sterling Silver-Lead company is building a four-mile flume and has erected a sawmill to cut the lumber.—The Spokane Lead Mines Co., operating the Bella May and the Diamond R., is building a 100-ton concentrator which will probably be ready next fall. Lack of transportation facilities is the drawback to the district now, but a line will be built before long. There is ore awaiting transportation.

Spokane, June 29.

(Special Correspondence).—The vein discovered 200 ft. west of the main working shaft of the Nellie S. mine has been unexpectedly encountered in a cross-cut from the bottom of the shaft at a distance of 35 ft.—The last carload of ore from the Jay Gould mine, near Chewelah, netted approximately \$32 per ton. It came from the 180-ft. level.—An adit drift on the Lucky Bill mine is in 250 ft., and the vein averages 30 in. wide. A contract has been let to drive it 100 ft. farther. There is some native copper in the ore.—The United Copper Co., after cross-cutting the vein by an adit at 600 ft. from the portal, drove a drift 50 ft. on the vein and then cross-cut it. The vein is 40 ft. wide and 95 ft. deep at that point and has 18 ft. of shipping ore on the foot-wall. On the 350-ft. level the ore is low-grade across 25 ft., but higher grade material is expected on the hanging wall.

Republic, July 5.

BRITISH COLUMBIA.

At Rossland, the big compressor of the Centre Star mines is being repaired and the Nickel Plate and War Eagle plants are furnishing compressed air. The vein on the Idaho is still being stripped. The War Eagle is looking good from

the fifth to the eleventh levels. Development is in progress on the 350, 400, and 450-ft. levels of the Iron Mask.—At Le Roi No. 2, the unwatering of No. 1 continues, but development has not started on the Surprise and You Know, as it is difficult to get men.—The White Bear hoist is being repaired and no ore or waste is being hoisted.—J. A. Miller has been appointed superintendent of the California-Giant properties.—Alex Robinson has started a few men to work on the Golconda group in South Deadwood.—A big slab of pyrrhotite, containing free gold, has been taken out of the War Eagle mine, and has attracted a good deal of attention, as free gold is rare in this camp.—Hoisting machinery has been ordered for the New Wellington coal mine. Two shifts are mining coal of excellent quality.—The Reward Mining Co. of St. Paul, owning 22 claims on the south fork of the Lardeau river, has let a contract for 500 ft. more of work. The tunnel is in 1,300 ft. and will cut



Map of Part of British Columbia.

two veins that are exposed on the surface.—J. P. Graves states that the Granby smelter will again be enlarged to a capacity of 4,500 tons per day, making about 40,000,000 lb. of copper per year.—The third furnace at the Boundary Falls smelter of the Dominion Copper Co. has been blown in and will be kept running if the C. P. railroad can keep it supplied with ore.—The British Columbia Copper Co. has established a new record for seven-day's smelting, it treating 13,647 tons, derived from the following sources: Custom ore, 4,438 tons; Mother Lode, 7,026; Napoleon, 347; and Oro Dintero, 1,836 tons of ore.—The Phoenix Amalgamated Copper Co. has recently purchased the Four Aces and Keystone claims just south of the Granby group, from G. W. Runberger and J. P. Dermody.—The new smelting record of the Dominion Copper Co.'s works is 5,566 tons in one week. This company is considering the erection of an aerial tramway from the company's mine in Phoenix to the Boundary Falls smelter, to obviate the difficulties of the constant ear shortage. Maurice M. Johnson, the manager, thinks it would not be over five miles long, although the ore has to go about 25 miles by rail.—Over 1,100 men are at work in Phoenix, the Granby company employing 500, the Dominion Copper Co. 300, and the Snowshoe, 125 men.

MEXICO.

SONORA.

The Llanos company of Bolindo, 45 miles from Santa Ana, has shut down the 50-stamp mill that has been crushing gravel, and will work the property by sluicing. This part of the State is showing great activity and the larger quartz mines have been amalgamated into one company through the efforts of F. B. Lloyd of San Francisco, with whom is associated Epes Randolph and Mr. Lindsey.

Special Correspondence.

London.

The Dumps of Stratton's Independence.—Report of Philip Argall.—Interesting Conclusions.—Treatment of Low-Grade Ore.—Tomboy and Camp Bird Outputs.—Mexican Returns.

In fulfillment of their promise made to the stockholders in March last, the directors of Stratton's Independence, Ltd., have issued a report from the consulting engineer, Mr. Philip Argall, on his new milling and mining scheme. Dealing in the first place with the ore-house dump, estimated to contain 600,000 tons of an average value, shown by careful and conservative sampling, of \$3.60 per ton, Mr. Argall states that after an exhaustive series of tests on this ore, he came to the conclusion that although the best extraction can be made by roasting and direct cyaniding, owing to cost of roasting in the Cripple Creek district this process is not applicable on ore of such low tenor. He remarks that it is a curious fact that the raw or unroasted sulpho-telluride ores of Cripple Creek will, when reduced to a suitable degree of fineness and agitated in cyanide solution, give an extraction of 50 to 60% of their gold contents. This rule appears to hold good whether the ore contains \$1 per ton or \$20 per ton in gold. It is obvious then that if by any process of concentration the bulk of the sulpho-telluride could be separated from the gangue, the latter would, on treatment by cyanide solution, give up one-half of its residual gold, and be reduced to a fairly low tailing. Experiments on a working scale not only confirmed this, but also showed that if the crushing and concentration were conducted in dilute cyanide solution, the maximum extraction from the tailing was practically reached in one hour's contact. In the first three tests conducted on a full working scale it was found that one-third of the gold in this dump ore could be recovered as a concentrate after a preliminary crushing to pass 0.03-in. screen aperture, the exact figures being: Test No. 1, 33.33%; No. 2, 32.87%; No. 3, 33.55%; average, 33.25%. These results show clearly that a uniform recovery of one-third can be made by simple concentration. The slime produced in crushing contained practically one-third the gold of the original ore. Tabulating the separate products resulting from crushing and concentrating 100 tons of dump ore, Mr. Argall shows the following result:

4.75 tons concentrate @ \$25.263 per ton.....	\$120.00
23.00 tons slime @ 5.50 " "	126.50
72.25 tons sand @ 1.57 " "	113.50
100.00 tons dump ore @ 3.60 " "	\$360.00

He obtained a combined extraction on the dump ore of 71.22%, but bases his estimate on 70% extraction. With this extraction, a recovery of \$2.52 per ton of the average value of the dump ore is effected at an operating cost (based on treating 10,000 tons per month) of \$1.52, leaving a net profit of \$1 per ton. Mr. Argall proposes the erection in the first place of one unit only of wet-crushing plant to treat 5,000 tons per month, reserving the second unit until the millsite, chosen on the most suitable spot, can be extended by the clearing away of the dump ore that now covers the ground. The erection of the second unit, which would double the monthly profit from dump ore, should be started in about six months after the commencement of milling with the first unit.

The second feature in the new scheme is the proposed working of the low-grade ore in the mine. Mr. Argall states that it is impossible to estimate accurately the quantity of such material available. Three possible

sources of low-grade ore in the property are enumerated: First, large pillars of mineralized ground near the junction of the Independence and subsidiary veins, also several pillars left on the main veins, and bodies of low-grade ore, as for example on the sixth level where the manager believes a large tonnage of \$5 to \$7 ore can be mined. A second source of low-grade ore is to be found in old stope fillings that have sampled \$5 per ton; this ore could be drawn and sent through the mill at a possible profit of \$1.50 per ton. Third, in mining by the 'caving' system a large tonnage of low-grade ore may be obtained. Some of the big stopes are now caved, and the lessees are drawing the caves, sorting out the rich ore, and screening out the fine, thus obtaining two high-grade shipping products, and leaving the low-grade in the mine. In the lode system of Stratton's Independence many veinlets, seams, and films of rich ore extend into the vein-walls, and while they are not rich enough or numerous enough to pay in ordinary mining, it is expected that by the 'caving' system this wall-rock can be handled profitably; furthermore, it is expected that in places bunches of high-grade ore will be encountered in the hanging-wall country that would for a time materially increase the production of high-grade ore (sorted ore) as well as enrich the fine or low-grade screening. In any case, Mr. Argall is of opinion that large quantities of very low-grade material will have to be handled, and to do this in the most economical manner he recommends the erection of a special breaker plant at the mouth of the shaft. This plant should crush, screen, and wash the ore for \$1 per ton, including the cost of mining. Assuming 300 tons of caved material gave 50 tons of screening assaying \$15,

Then 50 tons of screening @ \$15.....	\$750.00
Mining 300 tons @ \$1.....	\$300.00
Milling 50 tons @ \$3.50	175.00
Loss in tailing	70.00
	545.00
300 tons of crude ore at a profit of 68c. per ton.....	\$205.00

It is pointed out that this estimate is necessarily based on an assumed tonnage and value of screenings; it is a process that must be put into actual work to demonstrate not only the value of the crude ore but also the tonnage and contents of the resulting screened product. Mr. Argall states, however, that the lessees are at present obtaining from their method of hand-sorting the caved material in the mine a higher average than that taken in his estimate. At the same time he thinks that one is justified in an untried scheme like this in taking only half the profit shown in a hypothetical estimate, and in that case, the breaker-plant would show a profit of \$3,000 per month, though his personal opinion is that so long as the caves follow the vein-system the breaker-plant will more nearly come up to the profits shown in the above estimate.

The third and last feature of the scheme is the production of high-grade ore. Mr. Argall reports that the lessees should produce high-grade ore in fair quantity for some time to come. High-grade ore should also be produced from the caving system of mining hereinafter described, and also from stopes on the low-grade veins, which will doubtless contain in places bunches of high-grade ore easily picked out or mined separately. All the high-grade ore will be roasted, amalgamated, and cyanided in the proposed dry-process mill, together with the concentrate produced from the wet process (concentrating) mill. For the purpose of this new scheme ores above \$10 per ton are called high-grade, and it is proposed to work them by the dry process. Ores below \$10 per ton will be treated in the proposed wet-process mill, and are classed as low-grade. Summing up the monthly net profits under the three heads of the scheme as

described by Mr. Argall the figures are: From dump ore (two units), \$10,000; from the breaker plant on low-grade mine ore, \$6,000 (or one-half of this "on the safe side"); from leases on high-grade ore, \$4,000. Thus the directors' statement that the net earnings available for dividends as from the starting of the complete mill should amount to little short of £50,000 per annum appears reasonably justified. The following is Mr. Argall's estimate of the cost of erecting and equipping the plants he advises:

Breaker plant.....	\$ 20,000
Two units of wet-crushing plant.....	190,000
Water-works for plant.....	7,500
Dry-process mill, 3,000 tons per month.....	71,000
Dump-loading plant.....	15,000
Transformer-house and wiring.....	6,500
Total.....	\$310,000

On the financial aspect of the scheme, the directors report that the Company possesses ample funds for the purpose contemplated. Inclusive of profits at the mine to the end of May, the Company's cash amounts to £48,700. In addition there are net liquid assets of about £8,000, making a total of £56,700. During the construction of the mill, profits from the leases should accrue to the extent of, say, £15,000, and by the time the money for the second unit of the mill is required, the increased surplus from profits coming in during the next nine months will be amply sufficient for the purpose. Hence the net profits from the milling and mining combined as from starting of the mill will be available for dividends. Stratton's Independence stockholders may be puzzled at the omission in the published statements of any reference to the Cassel process. On inquiry, however, your correspondent is informed that in Mr. Argall's full report to the board, described as "a bulky document of a highly technical nature," the use of the Cassel filter is contemplated. Your correspondent has dealt somewhat lengthily with the scheme in question in the belief that the particulars given in his classified statement may be of interest not only to Stratton's Independence stockholders but to owners of other mining properties similarly situated. That considerable attention to the subject has been evoked is demonstrated by the fact that several offers from both sides of the Atlantic have been made by responsible parties to lease the Independence mine and dump. With regard to these negotiations it is understood that the directors, while recognizing that they are dealing with a proposition in the nature of a pioneer operation on a commercial scale, they are so confident of obtaining the results estimated by their consulting engineer that they prefer to advise the stockholders not to part with their property on a royalty basis.

Amerlean mining returns announced for May: The Tomboy mill crushed 9,200 tons of ore, yielding bullion to the value of \$69,000. Concentrate shipped 540 tons, estimated to realize \$33,500. Ordinary expenses for the month, \$43,000. Expenditure on construction or improvements (not included in ordinary expenses), \$5,900. The directors have declared a 12th dividend of 5 s. per share, free of income tax. At the Camp Bird, the mill crushed 6,562 tons of ore (dry weight), yielding 9,051 oz. bullion and approximately 518 tons of concentrate. Profit in Amerlean on sales of product during the month was \$146,464.

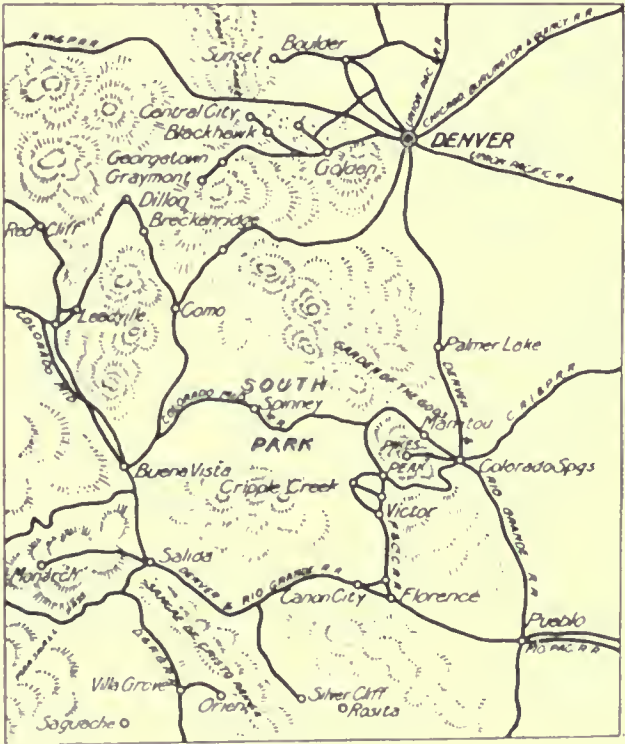
Mexican mining returns for May: El Oro Mining & Railway Co.; the No. 1 and No. 2 mills together crushed 23,375 tons of ore, producing \$208,468, less for working expenses, \$97,752, and for development expenses, \$12,475; total, \$110,227, equal to \$4.71 per ton; net profit, \$98,211. The profit from the railway for the month was \$12,249; total for mine and railway, in Amerlean, \$110,490. Espe- ranza: The mill crushed 14,168 tons of dry ore.

Concentrate shipped to smelter, 421 tons. Estimated realizable value of bullion produced, \$158,522; ditto of concentrate, \$103,907, making \$262,429; receipts from rents and other sources, \$476; total, \$262,905. Less working and administration expenses, \$120,108, profit in America \$142,797. Feet of development work, 1,060. The Dolores Company has had a banner return for May, coupled with more favorable news from the mine. Production \$115,000, expenses \$40,000, profit \$75,000, (£15,000). The mine manager states that the ore generally throughout the stopes had been exceptionally high-grade. Referring to stope-block No. 15 he reports the vein as from 6 to 10 ft. wide, running from \$180 to over \$500 per ton. With regard to development work the drift north at the 4th (bottom level) after passing through barren ground has again come into ore, 15 carloads of which gave an assay of \$59 per ton. On this the manager remarks: "The raise has demonstrated that the ore comes down from the third to the fourth level, so we can count reasonably on having a big block of ore between these two levels."

Denver, Colorado.

High Water at Lake City.—Western Federation of Miners.—Stratton Inheritance Tax.—Smelter Rates.—Production of Cripple Creek.—Denver Mint Scandal.—Tomboy Mines.

The Hidden Treasure mine, near Lake City, has been obliged to close down temporarily since the high water



A Part of Colorado.

of last Sunday washed out its dam and pipe-line. As a result of the break much damage was done to the wagon-road and railroad, especially to the bridges. Traffic will be greatly impeded for some time.

The leaders of the Western Federation of Miners, who have been for some time attempting to graft active socialistic politics upon that body, have succeeded, at least to the extent of having a preamble to that effect adopted by the convention in Denver. Before this can become a part of the constitution it must be also approved by the rank and file of the membership on a referendum vote. In all probability the result of the referendum will be the approval of the new policy by the majority, and it is likely that those who still entertain reasonable and sane

views of their duty to civilization, and of civilization to them, will leave the Federation in disgust, and the organization will become frankly what it has always been in effect, a band of "undesirable citizens" organized to upset the order of things as they are.

The Stratton inheritance case, which has been dragging through the courts for some time, has at last been finally adjudicated, with the result of upholding all the contentions of the State. The inheritance tax on the estate of the millionaire mine owner, that on the amount given to Harry Stratton, and the interest on these from the time when due, amounts to \$374,816. The contention of the State was that interest was due from the date of the death of the testator, in 1902, while the executors held that it was only due from the date of the appraisal of the estate, four years later. Unless a motion for a rehearing is filed, the matter is now finally disposed of.

A committee of the American Mining Congress is engaged in investigating the rates and charges of the group of smelters ordinarily known as the 'trust.' The penalty on copper ores seems to be the main bone of contention, and the committee seems to be much wrought up over the fact that shippers may send their copper ores to Utah and have them smelted without a penalty, while one is exacted at the Colorado smelters. This they propose to remedy by a method not yet made public. Most probably they will find that the simplest way will be to find enough copper ores to keep copper smelters going in Colorado.

The output of the Cripple Creek district in June was \$1,288,195, the tonnage being over 54,000. The increase in tonnage and decrease in value of output compared with the last few years is due to the steady advance in the exploitation of the lower grades of ore. The large tonnage handled by the new Golden Cycle mill has somewhat cut down the amounts handled by the other mills of Colorado City, but the latter are saying nothing, only biding their time until the treatment rates go up again. The small cyanide mills in the district continue to operate with good success, and more than one new one is being pushed to completion.

Much stir was caused recently by the statement that the coinage of the Denver Mint had become debased through the carelessness and inefficiency of the officials in charge. The investigation made by the Federal officials has gone to show that nothing criminal had taken place, and the irregularities were simply the result of careless and improper work.

Denver has recently attracted the attention of the Federal authorities in other ways. Last week nine promoters of fraudulent mining companies were arrested for improper use of the mails. The men are promoters of the Goldfield Golden Glow Mining Co. and of the Gold Leaf Consolidated Mines Co., both of which have been advertising themselves as owning fabulously rich properties. The example that will doubtless be made of them, it is to be hoped, will serve to deter such others as may prefer to exploit credulity rather than mineral wealth.

The Tomboy Mines Co. of Telluride has just declared a dividend of \$562,500 for the past year. Out of the profits of the company \$100,000 has been set aside for improvements in the mining and metallurgical processes, by which it is hoped to make an additional saving of \$1 per ton, with a correspondingly larger dividend for the year to come. The 2,100-ft. level is now being opened up, which will add largely to the reserves, and enable the assay value of the ore sent to the mill to be lowered to the average of the mine. Car shortage, bad roads, and the fact that smelting facilities are not available, has held the monthly output of Leadville for two months past at about 75,000 tons.

Butte, Montana.

Production in June.—A Decrease.—Output of the Companies.—

Fire in the Minnie Healey.—East Butte Development.—

Colusa-Leonard Extension.

The copper production from the Butte mines in June was 26,161,350 lb. against 29,017,550 lb. in May. There were a number of interruptions to work, and the strike of teamsters, which continued throughout the month, caused an almost complete suspension of mining by individuals and small operators who have to depend on teams for the transportation of ore to the railroads and smelters. The smelters of the Amalgamated and Clark appeared to back the ore-hauling concerns, for they refused to treat the ores of such companies and lessees as paid the demands of the strikers. The strike also forced a suspension of mining at the Gallatin and J. I. C. mines of the Anaconda, which produced from 200 to 250 tons of ore per day. It had been the general expectation that the Butte companies would in 1907 eclipse the copper production of 1906 by 10,000,000 lb. or more. So far the production has fallen behind that of last year about 8,000,000 lb., the decrease having been due to many causes, including a long term of unusually cold weather, fuel shortage, labor troubles, etc. It is therefore likely that instead of the production being 10,000,000 lb. in excess of that of last year it will be at least that amount short of the production of 1906.

The statistics of production in June are as follows:

Company.	Tons of ore.	Pounds of copper.
Boston & Montana.....	100,500	6,534,000
Anaconda.....	123,000	7,380,000
Butte & Boston.....	19,500	1,209,000
Washoe.....	10,650	628,350
Parrot.....	11,250	630,000
Trenton.....	12,000	708,000
North Butte.....	37,500	3,003,500
Coalition.....	45,000	2,970,000
Original.....	24,000	1,488,000
East Butte.....	6,750	526,500
Pittsburgh & Montana.....	7,500	525,000
Miscellaneous.....	3,000	225,000
Total.....	400,650	26,161,350

For a week operations in the Minnie Healey mine of the Butte Coalition Co. have been suspended on account of a smoldering fire between the 600 and 700-ft. levels, the gases from which drove the miners out of the mine. The fire originated through spontaneous combustion in some old workings that had been filled by former owners with all sorts of rubbish. The fire burned for several days before the gases became so bad that work had to cease, and miners were even driven out of the Leonard and Colusa mines of the Boston & Montana Co. which adjoin the Minnie Healey and connect with it. It was with great difficulty that the fire could be placed, but when that was done air was sent into the burning portion of the mine and all the smoke and gas forced out through the Minnie Healey shaft, which soon made it possible to resume mining in the Colusa and Leonard and on the lower levels of the Minnie Healey. The fire is being closely confined by bulkheads and cement walls, and openings have been drilled from the surface so as to introduce water. It will be some time before the fire is thoroughly extinguished, but the danger to the miners and the interruption of work have been overcome. The incident recalls the fact that in 1889 fire broke out in the St. Lawrence mine of the Anaconda Co. and all efforts to extinguish it have to this day proved futile, the fire constantly feeding itself on the combustible minerals in the ore. The fire area has, however, been thoroughly enclosed by a thick cement wall, and it cannot spread except deeper into the earth. Some portions of the mine are

almost unbearably hot. When the fire has burned itself out, if it will ever do that, this natural smelter will be broken down and the smelted product will be taken out.

The Davis-Daly Co. has decided to do some diamond-drilling on the 500-ft. level of the Smokehouse. The company has been driving on the vein and encountered some ore, but the vein became badly broken up and displaced. After exploring the ground in several directions without finding the orebody, the company decided to do further exploration with diamond-drills.—In another month the East Butte Co. will have connected its No. 1 and No. 11 shafts by a cross-cut. The two shafts are near the extreme limits of the property, and between them are nine other shafts, half of which are operated by lessees. The cross-cut from No. 11 has cut two veins and the one from No. 1 five veins. Of the latter the last one cut is more than 20 ft. wide, 18 in. of it being first-class ore and the remainder concentrating ore. The entire level is in what is known in the Butte district as the lean zone, which terminates in an iron cap overlying a secondary enrichment of the veins. This iron cap was penetrated by No. 1 shaft near the 600-ft. level and was found four feet thick. It remained in the shaft for some distance and immediately below the shaft cut into a good grade of ore which, at the 800-ft. station, carried considerable glance and had widened to two feet. The mining is almost entirely in the hands of lessees, who pay the company a 25% royalty, which is about the average royalty paid in Butte, though in some mines, notably the Ophir, lessees pay 35% to the company.

The Colusa-Leonard Extension Co. has contracted for a new first-motion hoisting engine having a capacity for 2,000 ft. The new compressor is in operation. A new electric pump with a capacity of 400 gal. per min. has also been ordered. The company has had some trouble in handling the water and sinking was impeded. The shaft is now 740 ft. deep and the company expects to reach the 1,000-ft. point late in August. Some exploration may be done at that depth, but the shaft will probably be carried to a depth of 1,500 ft. before any extensive work of that character is done, it being demonstrated by operators on the east side that great depth is required to get into good ore.

Mexico City.

Railway Consolidation.—The Mexican Central.—Wretched Service.—Fire in the Palmilla Mine.—Awakening of Parral.—The Cienega de Olivos District.

There is not a mining man in the Republic of Mexico who does not look forward anxiously to the final arrangements for the merger of the National lines of Mexico with that of the Mexican Central railroad, which has been so long in contemplation; this was authorized by the Federal congress, and yet now for some unknown reason it seems to be held in abeyance. Scarcely any complaint is heard against the service of the National lines, which are more or less under Government control, and proper service is obtained. But the service of the Mexican Central is beyond all power of conception by one who has not actually experienced it. This company has apparently been looking forward to a sale for some years and has done all in its power to make a good showing of earnings by wholly neglecting its roadbed, its rolling stock, and its clerical service, until now it is conceded throughout Mexico that once a piece of freight gets into the hands of the Mexican Central the chances are even that it will never be seen again; if it is not lost in a wreck then it is lost in or stolen from some warehouse at a division point (if it is a small piece) or thrown on some siding there to remain (if it is a carload). The writer

knows of an instance where a mining company on the line of the Mexican Central was 28 days in getting a carload of supplies from that road after the car had actually arrived at the mining company's receiving station. Is it any wonder then that there is a shortage of cars and that there are some 70,000 tons of ore and 30,000 tons of fuel belonging to the American Smelting & Refining Co. are hung up along the lines of the Mexican Central? And now the shortage of cars is to be greatly aggravated by the order issued this week by the Santa Fé to the Mexican Central that if the cars of the former are used by the latter even for hauling goods from Mexican points to the States, the former will refuse to allow its cars to be taken onto the Central's lines. Trainloads of Santa Fé empties are seen going north on the Central and thus shipments that could have gone north in these foreign cars must wait for other cars, and undoubtedly the action of the Santa Fé will be followed by other lines in the



Montana.

United States. It has come to such a pass that some mines have had to close down by reason of not being able to move their ores, and none of the smelters are running full blast because of shortage of ores and fuel. In addition to the shortage of cars on the Central there are periods on some sections of the line when there is no water for the engines; and this condition is allowed to continue when, in my opinion, the geology of the country is such that there is scarcely a point along the lines of the Mexican Central where artesian water could not be found if the wells were driven. Will the Government control straighten out these matters? It is to be hoped so, and so believed.

Report has it today that the famous Palmilla mine which made a millionaire of Pedro Alvarado, formerly a poor miner, was last night entirely destroyed by fire. If this is true it means a great loss to Parral, for the Palmilla pumps drained a large area that had not reached the depth of the Palmilla. This remarkably rich property, by reason of ignorance of the proper system of handling large bodies of ore, had been getting into a bad and really dangerous condition of late, and it was with a feeling of great relief to all Parral that it learned last week of the deal whereby one, a mining man so well known as Bert Peterson, was to take hold of the property. Mr. Peterson has for years been associated with J. F. Johnson in the latter's many holdings in Parral, so that a looked forward to his making a model mine of the Palmilla. But now a disastrous fire has changed the complexion of things. The general effect, however, may be beneficial, for Parral has been a little slow in coming to the mark and keeping abreast of the times in the way of modern equipment and improved methods, both in the

line of mining and in the treatment of ores, and this in a camp which is shipping out close to 300 tons of ore daily, besides treating a like amount locally. But the last year has seen quite a lot of new men taking hold of important interests. Among the more prominent of the new workers may be mentioned the Veta Colorado Mining & Smelting Co., which is erecting a 250-ton concentrating mill, the first for Parral, which it is expected to have completed early in September, and a cyanide plant may be added before the end of the year; El Rayo Mines Co., of J. B. Farrish, 40 Wall St., New York, and associates, which has been organized with a capital of only \$100,000, but contemplates taking over El Rayo Mining & Development Co., Descubridora Mining & Development Co. (of Johnson & Peterson), and the Buena Vista Consolidated Gold Mines Co. (known as the Wm. V. Pettit holdings), near Los Azules in Santa Barbara, and under the management of Bert Peterson, will greatly increase their production; and the Hinds Consolidated Mining Co., which is building a spur from the Santa Barbara station to its Clarinas and Reforma mines, which on the completion of the spur some time in September will greatly increase their already heavy shipments.

The Cienega de Olivos district is attracting attention at the present time. This district is by no means new, for in 1903 this tract was practically all denounced, but a large portion of it was afterward forfeited, and with the exception of one or two properties, work was abandoned. One of the properties, the Delfina, owned by the Hidalgo Mining & Milling Co., has been working steadily, and lately made a rich strike in copper ore, which has led to many new denouncements around this property, and the district is rapidly being taken up again. These denouncements are in the Municipalidad de Cienega de Olivos, Distrito Hidalgo, and 50 miles northwest of the city of Parral. The district is divided into three portions, the southwestern part being a gold-copper-silver section, the central-eastern part being largely copper, and the northern part gold. The recent shipments made from the Cienega de Olivos district run 24 to 26% copper, and 600 to 700 grams silver per ton.

Salt Lake, Utah.

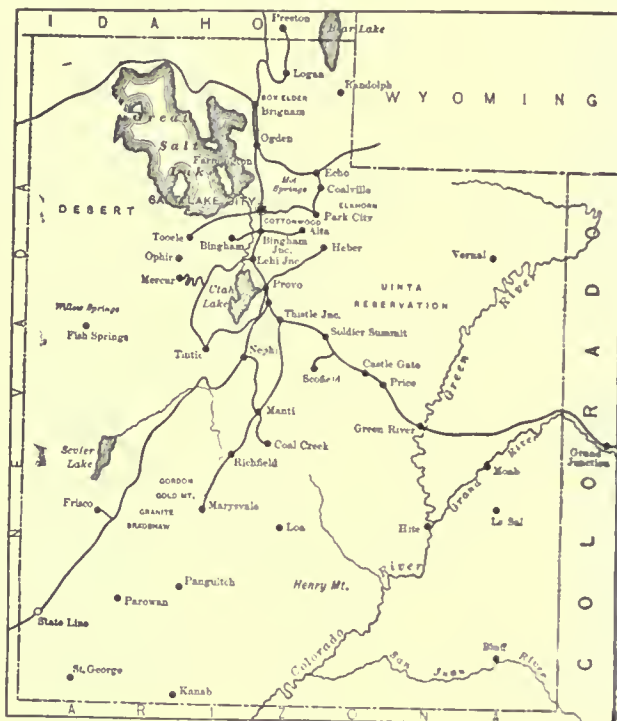
Shipments From Park City.—Labor Unrest at Bingham.—Activity at Tintic.—Several Dividends.—Output at Local Smelters.

The ore output from the mines of Park City during the month of June reached a total of 7,579 tons. Last week 1,596 tons were dispatched to the smelters, the contributing mines and amounts being: Silver King, 709; Daly West, 450; Daly Judge, 135; Little Bell, 80; Daly, 47; lessees, 175.—The Nevada Douglas Copper Co., which has headquarters in this city, has purchased the Ludwig copper mine at Yerington, Nevada. The first payment has been made and the mine is now in the hands of the Nevada Douglas Co. The erection of a smelter is under consideration. Walter C. Orem, of Salt Lake, is manager.—At the recent annual meeting of shareholders of the Consolidated Mercur Gold Mines Co., John Dern, G. H. Dern, H. W. Reed, E. H. Airis, and J. E. Frick of Salt Lake; A. W. Chesterton of Boston, and H. A. Bingham of Jersey City, N. J., were elected directors. The annual report will not be issued until about August 1.

There is much uneasiness among the operators at Bingham over the labor situation. The mining companies find it difficult to get sufficient help and agitators are taking advantage of this condition to talk higher wages. A strike of union miners in these camps is not unlikely. At Tintic, as well as at Bingham, a voluntary raise in wages was announced by the mining companies

not long ago.—The Centennial Eureka Mining Co. is installing a new steel building over its hoisting plant in the Tintic district as protection against fire. The company recently brought suit against the Bullion Beck & Champion Mining Co. to confirm its title to the Solid Muldoon and two adjoining mining claims. There is a great deal of activity in the eastern end of the Tintic mining district. A number of new companies have been recently formed. Recent developments in the Colorado, Beck Tunnel, and several other mines have had the effect of creating much interest in Tintic stocks on the Salt Lake Exchange, and prices in many instances have risen to boom figures. The Colorado has been marketing ore netting as high as \$10,000 per car.

Construction work is progressing favorably at the new smelter to be operated by the Tintic Smelting Co., and it is hoped to have the plant ready by the end of the year. The grading of the Eureka railroad, which is to operate



Utah.

between the principal mines and the smelter, is also progressing satisfactorily.—The ore and bullion settlements reported by Salt Lake banks for the first six months of the year reached the sum of \$14,913,600.

The National Ozokerite Co. has resumed the operation of its milling plant near Colton. Fifty tons of ore are being treated from which a mineral wax product is being manufactured. The Mormon church has sold the Grass Creek coal mines near Coalville, the purchaser being a syndicate of Salt Lake and Eastern capitalists. The consideration is said to have been \$250,000. The property is to be better equipped with a view to increasing the output of the mines. The Grass Creek company owns about 1,000 acres of land and operates a line of railroad 6½ miles long.—The management of the South Columbus Consolidated Mining Co., operating at Alta, Utah, has decided to put in a large air compressor and erect permanent mine buildings. By the time the proposed improvements are installed the mine will be as well equipped as any in the district.

The Newhouse Mines & Smelters Co. has ordered the payment of its first dividend of 50 cents per share, or \$300,000, on August 25. The May Day Co. has resumed dividend payments and will distribute \$8,000, or one cent per share, during the present month.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

MAGNESIA as an adulterant for paint has not been found as good for the purpose as baryta, as it does not take up oil so readily, and it settles to the bottom in the manufactured paint. As a result the paint men have given up the use of magnesite.

DEPOSITS of gypsum large enough to be worked for plaster are often quite impure. Gypsum, as excavated for a plaster plant, will usually carry varying and often high percentages of such impurities as clay, limestone, magnesian limestone, and iron oxide.

INGOT STEEL is steel cast into an initially malleable mass and containing so much carbon or its equivalent that it hardens greatly on sudden cooling. The word is rarely used in practice, but 'hard steel,' 'high-carbon steel' or 'half-hard steel' are used in its place.

ONE gallon water (U. S. Standard)=8.3389 lb., usually taken as 8½ lb. One cubic foot of water distilled (U. S. Standard)=7.48052 gal., usually figured at 7½ gal. One cubic foot of distilled water (British Standard) barometer 30 in., 62° F.=62.321 lb. 27,192 gal. of water are required to cover one acre of land one inch deep.

OZOCERITE is a natural paraffin, and is used for making shoe and leather polish, sealing wax, pencils, rubber adulterant, candles, and pomades, and for insulating electric wires. High-grade black Brunswick varnish is made from manjak, which is a form of asphaltum found on the island of Barbados and elsewhere in the West Indies.

THE mineral anhydrite is closely related to gypsum, being an anhydrous lime sulphate, with the formula CaSO_4 . It therefore corresponds in composition to the product which would be obtained by heating gypsum so strongly as to drive off all of its water of combination. Anhydrite occurs, but usually only in relatively small quantities, in almost all gypsum deposits.

THE supply of antimony ore marketed continues to be exceedingly small. China for the last five or six years has produced the greatest quantity of ore, but there has been a heavy falling off in these shipments. This may be explained partly by the manipulation in ore by speculative interests in China, and perhaps to a more marked degree by the sudden and unexpected exhaustion of certain mines in that country.

FROM Ears Mtn., 40 miles east of Cape Prince of Wales, specimens of supposed tin-bearing rock have been brought by a number of parties; but, although tin ore has undoubtedly been found there, the minerals taken for cassiterite are, more often than otherwise, either tourmaline or augite. What the extent of the deposits may be is wholly unknown. Some stream tin has been found in the creeks heading in the mountains.

THE chief use of tungsten is in the manufacture of tungsten steel, and this again is mostly used for high-speed tools, magnet steels, and in European countries also for armor plates and projectiles. The percentage of tungsten in tool steels varies greatly, according to the special uses for which they are intended, but tungsten always imparts to the steel the property of self-hardening

in the air after forging without necessitating any of the usual methods of tempering.

STEELS containing a low percentage of chromium are tough and perform excellent work on the softer varieties of steel and cast iron, but when tried on harder materials the results obtained are not so good. With an increased content of chromium the steel becomes much harder, and greater cutting efficiency is obtained on hard materials. It has been observed that with an increase of chromium there must be a decrease in carbon to obtain the best results.

THE Florida phosphate rock deposits extend in a rather narrow curved belt at a distance of about 20 miles from the Gulf of Mexico and approximately parallel thereto for nearly 300 miles from near Punta Gorda on the south to a point west of the Apalachicola river on the northwest. The hard rock deposits of the Eocene beds consist of transported materials, but those of the Miocene strata are in place, though there are some boulders of foreign origin.

THROUGHOUT the great semi-arid and arid region comprised within the boundaries of Idaho, Utah, and Nevada there are extensive surface deposits of salt, some of which are associated with bodies of water, while others are not. The most famous of these is the Great Salt Lake of Utah and its immediate vicinity. The salt is won from the brine by simple open-air evaporation in great shallow artificial ponds, care being exercised not to allow the bitter salts of the lake waters to precipitate.

THE principal commercial source of salt in Kansas is the deposits of rock salt in the Permian strata of the central and south-central part of the State. About one-half the production is from direct mining; the remainder is from artificial brine made in wells driven down to the deposits. Salt is also found in salt marshes, or 'salines,' where it has been brought by leaching from clays associated with the Dakota (Cretaceous) sandstone, and in some of the Pennsylvanian beds of the eastern part of the State.

THE oil-asphaltum produced by the refineries from California crude oils is the result of doing artificially what has been done slowly by nature at several points in the State. The manner of manufacture was described at length in the report upon the production of asphaltum and bituminous rock in 1904. The process consists in careful and comparatively slow distillation of crude oil at uniform and definite temperatures. The value of the product depends upon the skill and care of the refiner. Several grades, varying from a highly viscous liquid to a hard brittle solid at ordinary temperatures, are made, which are adapted to the uses to which the product is to be put.

THE most important beds of phosphate rock are those of Florida, more than three-fifths of the total tonnage for the United States being produced in that State, with a value nearly two-thirds that of the total production for the country. The phosphate rock of Florida is divided by Eldridge into hard rock, containing about 36.65% phosphoric anhydride, corresponding to 80% phosphate of lime; soft rock, usually averaging less than 22% phosphoric anhydride, 50% phosphate of lime; land pebble, averaging 32% phosphoric anhydride, 70% phosphate of lime; and river pebble, averaging 20% phosphate anhydride, or 45% phosphate of lime for the Black Creek deposits, and 28.40%, 61% phosphate of lime, for the Peace River beds.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

A Question of Practical Mining.

The Editor:

Sir—Your editorial of June 8 on 'A Question of Practical Mining' came to hand just as I was preparing a rough draft on 'The Cross-cutting Evil.' I had in mind especially the cross-cut adit; your editorial placed most of its emphasis on the vertical shaft in country rock. In effect they are the same, except that the shaft-sinker rarely gets as far from the lode as the bold 'cross-cut tunnel' man is likely to do. In some few camps, of which the Cœur d'Alene is perhaps the most striking example, the orebodies are so persistent and continuous that cross-cutting from the nearest gulch has in many cases been the most successful and satisfactory way of opening up the deposits. But the success of the few has led to the failure of the many, the minority's meat has been the majority's poison, and foolish cross-cutting has wasted more money and led to the abandonment of more promising properties than any other one thing.

Time after time throughout the entire West, from Alaska to the Mexican line, have I seen a man with a fair surface showing, sink a 10 or 20-ft. hole and on the data, as to dip and strike, so obtained, leave the only good thing he had in the world and hie himself and his miners to the nearest ravine to begin cross-cutting. Sometimes the surveyor is called upon for direction, but usually that is considered a superfluous detail, and our friend and his force start off through a mile or more of the toughest kind of country rock, to open up a quantity of ore, the tonnage of which is limited only by the prospectus writer's imagination. The results are rarely worth recording. The only camps in the West that do not afford instances of this stupendous folly are those of southern Nevada, where tunneling is impossible because of the topography.

"Stay with your ore, boy, stay right with her," my old California partner used to tell me, and that bit of philosophy should be blazoned in box-car letters on the walls of mining companies' offices and miners' cabins alike. Those of us who have crept through powder smoke to scan the last traces of the streak we were following, know what changes a single round may show and realize how easily the lode may be lost without going thousands of feet away to explore the adjacent formation.

If the deposit is in such a situation that an adit can easily be driven to take out the ore, put in the adit after sinking on the vein, and then (if time is a consideration) the adit level may be driven both ways.

There is no sense in being afraid of a little hoisting during the prospecting stage. A windlass is good for the first 50 ft. (or 125 if necessary), and a good stout whim-horse, whim, and tripod are good for 250 ft. as long as water is not a serious consideration. A small steam-hoist, if water and fuel are plentiful, or if not, a gasoline hoist, need be no great item of expense, and will generally pay for itself after the first 100 ft. In addition, if the property is one with which men of small capital can afford to deal, the ore taken out should be paying for its extraction and possibly contributing to a treasury fund for the adit to be driven when the vein has been proved.

FRANCIS A. THOMSON.

Pullman, Wash., June 26.

Vacuum Slime-Filters.

The Editor:

Sir—In view of the articles that have appeared from time to time in the columns of the MINING AND SCIENTIFIC PRESS as to the merits of the Moore and Butters systems of vacuum-filters, having had some experience with both, I would like to add a few remarks to the general exchange of ideas through your columns.

I do not think there is much difference in either system as far as cost of operation and maintenance is concerned, but I do think there is considerable difference when it comes to the maintenance of the best conditions for the highest efficiency in the vacuum type of filter. It makes no difference which of the two filters mentioned is used for making the cake, as, with a given vacuum and pulp conditions, either of them make a cake equally fast. Therefore, it comes to a question of displacing the pregnant solution contained in the finished cake by barren solution or water.

The best conditions for perfect displacement are obtained by having a homogeneous mixture of the pulp in the filter-box throughout the time of making the cake and by maintaining uniform conditions until the end of displacement, when the deposited slime is ready to be discharged. By uniform conditions, I mean a constant vacuum, constant hydrostatic pressure, and as little exposure to the air as possible. Under these conditions I find that the displacement is almost perfect, no appreciable decrease in strength of cyanide being noticeable until nearing the finish of displacement, when the decrease is rapid down to the strength of the barren solution with which the washing is being done, which shows a displacement of the pregnant solution contained in the cake, with very little dilution.

Dilution, when displacing with water or barren solution, is to be avoided, as it means a larger amount of solution to be passed through the zinc-boxes, and, in the event of water being used, it also means a larger quantity of waste solution.

The methods of operation of both the Moore and Butters filters have been given at some length in your columns at various times, but for the purpose of comparison I shall briefly outline them again.

In both systems the storage, or equalizing-vat, is placed to one side of the filter-box, pulp being drawn from it to keep the leaves of the filter submerged during the formation of the cake.

In the Moore system the whole nest of leaves (which are attached to a frame) is removed from the filter-box by a traveling crane and delivered into a displacing-vat, which is immediately alongside the filter-vat, the vacuum being maintained during the moving of the loaded nest of leaves to the displacing-vat. The unit is composed of three filtering-vats, two for displacing, and one in the centre for loading.

When the crane has removed the filters from the loading-vat and deposited them in the displacing-vat, it is disconnected and taken to the other nest of filters, which are in the other displacing-vat, and when the slime-cake on the filters is discharged they are brought over into the loading-vat, and the making of the cake commences without loss of time.

In the Butters system the filters are stationary in the filter-vat, and, when the cake is made, the pulp is pumped back into the storage-vat, the vat is washed out with solution and is then filled with water, and displacement commences. When finished, the cake is discharged, the surplus water is run back to storage, and the discharged slime is sluiced to waste. The vat is again sluiced out to remove any particles of the discharged

cake adhering to the sides, and again pumped full of slime for the next cycle of operations.

A comparison of the time consumed for a complete cycle is as follows:

MOORE SYSTEM AT LIBERTY BELL MILL, TELLURIDE, COLO., JANUARY, 1906.		
	Hr.	Min.
Making cake.....		45
Transferring from loading to displacing-vat.....		5
Displacing or washing cake.....	1	0
Sampling.....		5
Discharging.....		15
Transferring from displacing to loading-vat.....		5
Total time per cycle.....	2	15
BUTTERS SYSTEM AT COMBINATION MILL, GOLDFIELD, NEV., MARCH, 1907.		
Filling filter-box from storage.....		25
Making cake.....		30
Pumping pulp from filter-vat back to storage.....		22
Filling filter-vat with waste solution or water.....		20
Displacing or washing cake.....	1	0
Sampling.....		5
Discharging.....		15
Running surplus wash solution to storage.....		6
Striking out discharged slime residue.....		8
Total time per cycle.....	3	11

In comparing the above tables for time consumed by the various steps in each system, it will be noticed that the transfer from the loading-vat to the displacing-vat in the Moore system occupies five minutes. During this short period of time the vacuum is fully maintained; therefore, there is no change in this particular part of the operation; the exposure to the atmosphere is short and the change from the hydrostatic pressure of the pulp on the finished cake to that of the water on the same in the displacing-vat is rapid.

In the Butters system the transfer of the remaining pulp back to storage after the cake is made occupies 22 minutes; the pumping of the water for displacing (after all the pulp is out) occupies 20 minutes, making a total of 42 minutes from the finishing of the cake before displacement can be commenced. This long period necessitates the vacuum being dropped from 21 to 5 inches.

The difference in total time consumed per cycle, other than in making the cake and displacing, is seen to be 30 min. with the Moore system, and 1 hr. 11 min. with the Butters, the saving in favor of the Moore system being 1 hr. 11 min. per cycle, but the saving of time is not the only consideration.

The length of time occupied between finishing the making of the cake and the commencement of displacing it in the Butters system necessitates dropping the vacuum down to five inches, or barely sufficient to hold on the cake, otherwise the cake would be so badly air-cracked that displacement would be impossible. (A three-quarter inch cake under 18 in. vacuum will crack beyond redemption in seven minutes.)

When the vacuum is lowered, after finishing the cake, much of the moist exterior portion of the cake drops off when the hydrostatic pressure is removed, it being a difficult matter to adjust the vacuum at the best point for any particular cake; for if too high, the cake will be badly cracked; and if too low, the cake has a tendency to slough off.

In the 12 min. consumed in pumping the pulp back to storage and the water into the filter-box for displacement, the extreme top of the cake is exposed for the full period of time to the atmosphere and the low vacuum that is maintained, the pulp recedes slowly down the cake during the pumping out of the pulp, and the cake is slowly submerged during the entrance of the water. Therefore, there is a period of time (about 26 min.) in which the extreme upper half of the cake is exposed to the air longer than the lower half, and with sufficient vacuum to hold the cake on the filter-leaf there is also

sufficient to cause displacement as the water slowly rises with the result that the pregnant solution in the lower half of the cake is thoroughly displaced long before that in the upper half and a large amount of dilution occurs, as the large quantity of weak barren solution necessary for displacement goes to prove, at the Combination plant it being four and one-half times the amount of moisture contained in the cake before displacement.

It will be seen that in the time schedule of the cycle of operations the Butters system will have to be considerably changed to allow of the best working conditions. And I consider it preferable to use one vat for loading and a separate vat for displacing, as then the small loss of time necessary for washing out the filter-box when changing from pulp to water and the reverse are avoided, and it also avoids the constant small losses that are bound to occur by this method through mixing of small amounts of pulp and pregnant solution with waste solution when they go through the same system of pumps and piping, and the richer the solution the greater the loss.

The wide difference in the capacity of the two plants makes it difficult to give a just comparison of the cost of operations, the Liberty Bell plant at Telluride having a capacity of 450 tons per day and the Combination Mines plant at Goldfield 193 tons per day as at present equipped.

The labor employed at the Liberty Bell at the time of which I write was two men on each shift, one of whom acted as shift-boss and had general supervision of settlers, agitators, and Moore filters, making all necessary titrations throughout these departments. At the Combination plant, one man on each shift attends to the filter-plant besides making other titrations in the leaching-plant, so that with the small unit as installed, that is, two filter-boxes of 28 and 30 leaves, respectively, one man per shift could possibly handle the full capacity of the plant or 193 tons per day.

The power consumption at the Liberty Bell is two 10-h.p. motors at the transferring cranes and one 40-h.p. motor to operate the vacuum and other auxiliary pumps connected with the filtering system, the same motor also operating a Goulds triplex pump that returns all solution used in milling the ore to the top of the mill, a lift of about 80 ft., requiring about 7 h.p., constantly, the total power consumption being 53 h.p. to charge against the filter equipment. The power consumption at the Combination plant when operating two Butters pumps, which the recent new addition makes necessary (the plant being two units), is 20 horsepower.

The Combination plant, then, with its two units, one of 28 leaves and the other of 30 leaves, can handle 193 tons of dry slime per day when working at a maximum capacity, with labor of one man per shift and a consumption of 20 h.p. The Liberty Bell plant, with its four sets of leaves consisting of 67 each, will handle 450 tons per day when working at maximum capacity, with the labor of two men per shift and the consumption of 53 h.p. Therefore, as far as direct comparison of the actual operating costs of the two plants goes, there is not much difference. But two important items that affect the capacity of the Moore plant at the Liberty Bell, and that so far have not been taken into consideration, are the sticky nature of the ore handled and a difference of 3,000 ft. greater altitude.

In taking up the question of maintenance it will be noticed that the total number of leaves in the Liberty Bell plant is 268 against 58 leaves in the Combination plant, hence, allowing for an equal life in each case, the renewal cost for this item on the Moore plant will be almost five times as great as on the Butters plant at the Combination, but the rule previously mentioned still holding good, that a given pulp and vacuum condition

will produce the same cake in either system, the Moore plant at the Liberty Bell if working on Combination ore would have a capacity of 805 tons per day against 193 tons per day of the present Combination plant. In the moving parts of the crane in the Moore system, the main item for expenses for repairs is the renewal of the lifting cables, which require renewing about once a year if properly adjusted when put on. The repairs that are necessitated by the cranes are offset by the repairs to the centrifugal pumps in the Butters system. With the Moore system, where heavy loads of slime are moved from one vat to another, there is always the possibility of accidents, for instance, a cable breaking and causing a bad wreck, running up the repair bills rapidly, but with properly designed apparatus the probability of such an occurrence is very remote.

It is supposed that the moving of the filters greatly lessens their life by straining the canvas; such is not the case, as one cannot feel the least jar when the crane starts to lift, the vertical velocity being only seven to eight feet per minute while hoisting the loaded baskets and the same when lowering into the displacing-vat, and there is apparently no more difference in the cake or filters after moving than if they had not been removed from the loading-vat. The suspended load on each filter-leaf is the same in either case, whether the filter with its load of slime is removed from the vat full of pulp, or the pulp removed from around the filter, the only difference being in the length of time the filter is required to sustain the load of slime, unaided by hydrostatic pressure of either pulp or water, which maximum length of time is seen to be five minutes in the Moore system to 44 in the Butters.

In a comparison of costs of installation, a 58-leaf plant such as is used in the Combination mill will be taken and the main items of necessary material for each one tabulated.

BUTTERS SYSTEM.	MOORE SYSTEM.
2 1 by 10 ft. filter-boxes.	3 11 by 10 ft. filter-boxes.
1 14 by 12 ft. pulp storage-vat.	1 14 by 12 ft. pulp storage-vat.
1 14 by 12 ft. water " "	1 12 by 10 in. vacuum pump.
1 12 by 10 in. vacuum-pump.	1 10-h.p. motor.
2 4-in. Butters centrifugal pumps.	1 20-ton crane equipped with
1 20-h.p. motor.	1 10-h.p. motor.
58 filter-leaves.	1 4-in. centrifugal pump.
	58 filter-leaves.

It will be seen that the Moore system requires three filter-boxes against only two needed in the Butters, only one storage-vat being needed, and that for pulp in the first instance, as against two in the second; and a 20-h.p. motor against two 10 h.p. The main difference in the cost of installation is in the crane, which will add 35% to the total cost of the plant. The above equipments comprise an equal filtering-area in each case. The Moore system will handle 22 charges in 12 hours, and the Butters system 10 charges in 12 hr. 44 minutes.

To summarize: The operating costs of either system are about equal, as are also the maintenance and repairs.

The installation cost for the Moore system is 35% greater than the Butters system for an equal filtering-area.

The capacity is 50% greater in the Moore system than in the Butters system for an equal filtering-area.

The efficiency of the Moore system for the recovery of pregnant solution with the least amount of loss and dilution, is higher than the Butters system for reasons previously given.

There is no doubt but that given ideal topographical conditions, the Butters system can be a great deal better arranged than here at the Combination plant.

Where sufficient elevation is available to allow of ample pulp and water storage above filter-boxes, and also the same ample storage below (to again allow for the storage of pulp and water), a great saving of time is

obtainable by allowing the pulp and water to flow in and out of the filter-box rapidly. This would necessarily greatly increase the cost of installation. Under such conditions the amount of pulp and water to be moved back up hill after each cycle of operations would be performed over a long period of time and not obstruct the filtering operation, instead of a short period during which filtering operations must cease, as at the Combination plant.

But even under these conditions, which have materially lessened the time consumed and also improved the conditions for displacement by removing the pulp from around the filters rapidly and getting them quickly submerged in the displacing medium, we have not eliminated the obvious opportunities for loss, that is, by alternately running pregnant solution and water through the same pumps and pipes and into the same receptacles, as a large percentage of the water that in this way becomes mixed with the small amounts of pulp and pregnant solution has to be allowed to run to waste with the discharged cakes of slime. Therefore, the less opportunity there is for any such mixing, whether accidental or unavoidable, the better. Hence my reason for saying that a loading-vat in which the cake is made should be used for that purpose alone. And the same reasoning holds good as regards pipe-lines and pumps for moving pulp containing pregnant solution.

Since commencing this contribution, Mr. E. H. Nutter of the Liberty Bell Mill at Telluride, has given us a further article on the Moore filters in use there, slightly changing the figures as shown in the table I have given for time consumed per cycle, which change no doubt comes from over a year's further experience with the plant. I am hoping that he will furnish us with some valuable figures from recent operations there, and that Mr. Mark R. Lamb will do the same with reference to the more recent installations of the Butters system in Mexico, for the benefit of the readers of the MINING AND SCIENTIFIC PRESS.

A. G. KIRBY.

Goldfield, Nevada, June 15.

PRICES IN KLONDIKE.—The wages of mechanics in the Yukon Territory, per day of 10 hours, is \$10; common laborers, with board, \$4 to \$5; without board, \$6; draft teams, per day (two horses), \$25; clerks, per month, \$150 to \$300. Everything consumed in the way of living costs from two to three times as much in this country as it does in the United States. There is no article sold for less than 25c., no matter how trivial, as there is no money in circulation of a lesser denomination than that amount. The cost of living will remain high as long as the means of getting supplies into the country remain as they are, and what is true of the Yukon Territory is true of the Yukon valley from the Alaskan line to the coast. The only relief suggested for these conditions is a trunk-line railroad from the open sea into the heart of this great valley, to be in some way under the control of Government authority, in order to keep down excessive freight and passenger rates.

COPPER OUTPUT OF CANADA.—The production of copper in British Columbia has increased 800% during the past 10 years, while the remainder of Canada has increased but 50%. The whole of Canada produced 13,300,802 lb. in 1907, British Columbia's share being 5,325,180 lb., while of the estimated 55,000,000 lb. total production in 1906 British Columbia's output was 43,000,000 lb. A Canadian editor states that the dividends declared last year by British Columbia mining companies amounted to between \$3,000,000 and \$4,000,000.

A Tin Deposit Near Spokane.

Written for the MINING AND SCIENTIFIC PRESS
By A. R. WHITMAN.

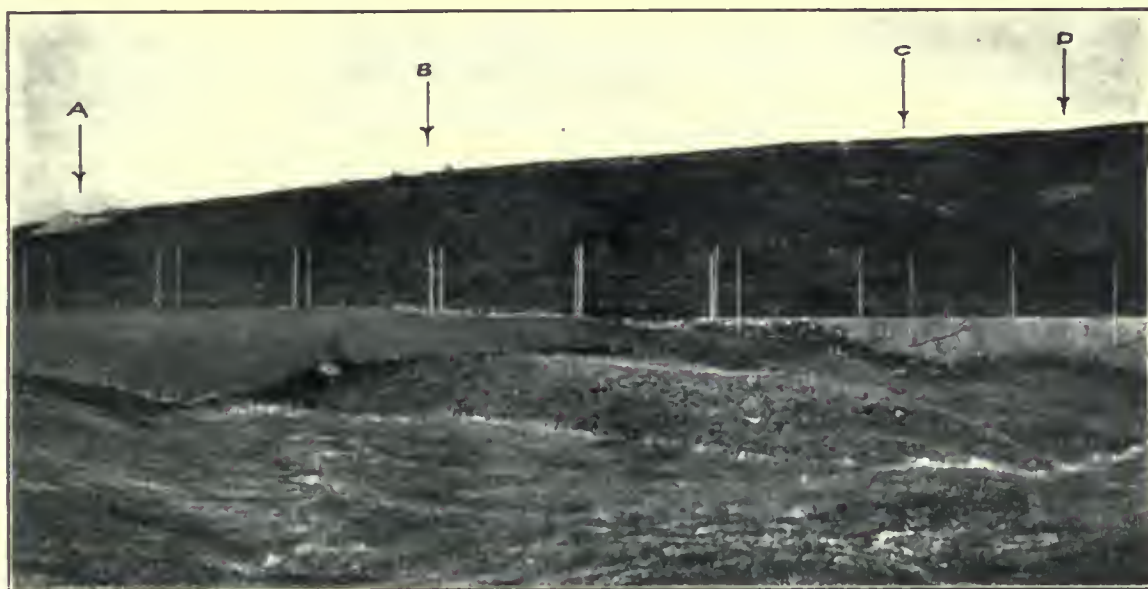
In the issue of June 1 of this journal there appeared a description, by the writer, of some of the geologic phases of the new tin discovery near Spokane, in which nothing was said about its economic importance. By request, the present article was written in an attempt to give this supplementary information.

The workings of the mine are situated on the south slope of Silver hill, at the foot of which runs an electric railway, belonging to the Spokane & Inland Empire Railroad Co. In direct line, Silver hill is only six miles distant from the limits of the city of Spokane, but the distance of transportation is about 11½ miles.

The ore will have to be concentrated at the mine, and the tin concentrate shipped through Spokane to some smelter. Though water has not yet been encountered in the shaft now being sunk from the west cut, it doubtless

the 60-ft. shaft—the ore going to the mill would have a gross value of \$21 per ton, and a net value of approximately \$14.64 per ton. The East Pool and Agar tin mines of Cornwall, have been worked for 69 years, and in that time have paid \$350 per share in dividends on 6,400 shares of stock, on which only \$23 has been paid up. This profit was derived from ore carrying 1% of recoverable tin, in the presence of arsenic, tungsten, and copper, and which has been worked largely by Cornish methods. It would seem, therefore, that a mine with such good ore and such a favorable situation as the one on Silver hill, ought to compare very well with the Cornish mines, provided only that the deposit be of equal extent.

This question of extent is one that only actual exploration can settle. There are plenty of theories on the subject, but they are inconclusive. They would favor the idea of a large orebody; but actual exposure of this body is a safer basis for estimating its magnitude; and it remains for future development work to accomplish this.



Silver Hill, on the Spokane & Inland Empire Railway.

will be, when this approaches the level of Moran Prairie, which will be only one or two hundred feet. From this source a concentrating plant, built just below the shaft, could derive an ample supply of water. From the drying-floor of the mill a chute or short gravity tram could deliver the concentrate to ore-bins at a siding close to the main tracks. Thus, after hoisting from the mine, the ore would go through the mill to the freight-cars entirely by gravity.

The ore is cassiterite, and is remarkably free from any such impurities as are associated with the output of other tin mines; and the gangue is chiefly a mixture of quartz and aluminum silicate. This makes the ore easy to mine and mill, for the cassiterite, having a specific gravity of 6.9, would be readily separated from the gangue, having a specific gravity of 2.45. The slight tendency of the cassiterite to slime would cause the only complication in the otherwise unusually simple process of concentration. Numerous tests made on the ore have demonstrated that a concentrate running 70% tin could be produced; and the character of the ore together with the favorable situation, would make the recovery and shipment of such a product exceedingly cheap.

If this concentrate should be shipped to the smelter at Tacoma, it would have, at the present price of tin, a net value of \$107 per ton. Then, on the basis of 3% tin—which is the value of the ore on the dump, taken from

It is certain, however, that the deposit as thus far exposed is the richest in the United States, and is well worthy of further exploration.

THE Government of British Columbia, at the session of the local Parliament which adjourned recently, made an announcement that at the next session, which will convene early in 1908, it would bring in a bill requiring that all iron ore mined upon provincial lands should be smelted within the Province. The property upon Texada Island was Crown granted years ago, and the new law may not apply to exports from that property. There are many other large deposits of magnetic iron ore upon the west coast of the mainland of this Province. Upon Vancouver Island large deposits of bog-iron ore are reported, which will be useful in fluxing the magnetic ores. There are large quantities of hematite ore in the interior. Texada island is rich in limestone, much of which approaches nearly to good serviceable marble. A mining company, operating on the northern end of Texada island, in addition to shipping ore rich in gold and copper, also operates two lime-kilns and supplies a large amount of lime to Vancouver, Victoria, Seattle, and the Hawaiian islands. At the present time a large quantity of pig iron is brought here from Scotland, which the experts pronounce an inferior grade to the pig iron manufactured from the ores of Texada island.

the consecutive number on the report under 'Desc.,' and the grand total under 'Total.' On the last of each month these cards may be transferred to the general account.

To keep track of the supplies consumed, I use a card as shown in Fig. 9, with indices identical with those shown in Fig. 2, and enter them up each day from the daily

the different departments. While this system may seem long in the describing, it is in reality exceedingly simple, as one process follows another in regular order. For a mine employing 100 men the accounts have been kept with this method by one man in three or four hours each day and everything kept in ship-shape all the time ; there is no hair-tearing rush at the first of the month to get the accounts for the preceding month into shape, for they are always in shape, with no more to be done on the first of the month than any other day, with the exception of the payrolls and the monthly report, if one is required, the information for which is right up-to-date.

For payrolls I use a book containing double sheets, the top or original sheet being of light white paper and perforated for removal, while under sheet, or duplicate, is of yellow paper and not perforated. They are ruled like a time-book with 31-day spaces and total days, rate, amount, and reduction, and net-amount columns, and a column for signatures. They are made up for the first of each month and the time kept on them during the month, using carbon-sheets between the originals and duplicates and an oiled sheet to keep from copying through. At the end of the month all that is necessary to do to get ready for payday is to

reports. At the end of the month these cards have only to be added to furnish the information for a monthly cost-sheet generally required by the head office.

In Fig. 7 is given a form for a warehouse record, showing the amount of supplies received, used, and on hand—valuable information for the purchasing department. These cards are also entered each day from the daily reports.

For individual accounts I use the card shown in Fig. 8 with a plain, alphabetical index, if the names are used, or a numerical index if the 'Account Number' is used. I have my bills rendered in duplicate, and as fast as they are received and checked, they are stamped with a serial number and entered on the card, giving the serial number for reference under 'Desc.,' and the brief clue to the contents under 'Item.' The invoices are then filed numerically and vertically, just as the reports are filed (Fig. 3). When paying bills, I send the original and duplicate invoices, together with a check for the amount to the seller, and when the bills are receipted and returned, I send the original to the head office and file the duplicate in its proper place. All supplies are charged to 'Warehouse' when received and credited to 'Warehouse' from the totals shown on the daily reports. This does away with the awkward and troublesome vouchers with which most mine-offices are burdened, where a form has to be filled out for each set of bills and the bills distributed to

carry out the extensions. When the payrolls are signed up the originals are torn out and sent to the head office and the duplicates stay in the book. The names are numbered and slips bearing the names and numbers

[illegible]

Fig. 7.

[illegible]

.....MINING CO.

Form A.

DAILY MINE REPORT.

Date.....190.....

LABOR.

	Superintendence		Power		Stoping				Development				Prospecting				Repairs		Total	
	No.	Cost	No.	Cost	No.	Cost	No.	Cost	No.	Cost	No.	Cost	No.	Cost	No.	Cost	No.	Cost		
Foreman																				
Shift-bosses																				
Miners																				
Muckers																				
Carmen																				
Skipenders																				
Timbermen																				
Blacksmiths																				
Machinists																				
Engineers																				
Firemen																				
Framers																				
Carpenters																				
Laborers																				
Total																				

SUPPLIES.

Powder, lb.																		
Caps. No.																		
Fuse, ft.																		
Candles, lb.																		
Oil, gal.																		
Nails, lb.																		
Iron and steel.																		
Track																		
Pipe and fittings																		
Coal																		
Wood																		
Electric power																		
Timber																		
Lagging																		
Total																		
Grand total																		

	For Day	Last Report	Total	Feet Driven	For Day	Last Report	Total
Tons of ore hoisted							
Tons of waste hoisted							
Tons of water hoisted							

Fig. 4.

.....MINING CO.

Form B.

DAILY MILL REPORT

Date.....

	Tramming.		Crushing and sizing.		Concentrating.		Shipping.		Total.		MILLING.		
	No.	Cost.	No.	Cost.	No.	Cost.	No.	Cost.	No.	Cost.	For day.	Last report.	Total.
Foreman											Day run, hours		
Millmen											Night " "		
Battery-men											Mercury fed, oz.		
Vanner-men											Amalgam, oz.		
Crusher-men											Ore to mill, tons		
Trammers											Assay of ore		
Laborers											Feed, tons		
Total											Value of feed, per ton ..		
											Total value of feed		
											Value of tailing, per ton ..		
											Total value of tailing ..		
											Net value by assay		
Shoes											CONCENTRATES.		
Dies											Production, dry tons ..		
Screens											Assay value.		
Quick											Total value ..		
Machine repairs											SHIPPING.		
Power											Tons shipped		
Oil											Value per ton		
Water											Total value ..		
Lights											Value concentrates on hand		

ASSAYING.

No.	Description.	Gold, oz.	Value
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Fig. 5.

more than 100 men, but it seems to me that by adjusting it to the conditions it might be made to work admirably even for a large mine.

TRIPOLI DEPOSITS IN CALIFORNIA.—The diatomaceous deposits so widely distributed in the Coast ranges of California are found in such purity and inexhaustible quantities in northern Santa Barbara county as to give them great commercial value. The deposits are variously known as infusorial earth, tripoli, diatomaceous earth, and, in Santa Barbara county, ‘chalk rock.’ The most

chalk rock is inappropriate, for although the deposits resemble chalk in appearance, they are made of silicious instead of calcareous material.

MONAZITE AND ZIRCON IN 1906.—The monazite produced in the United States in 1906 all came from North and South Carolina. The output of crude sand amounted to approximately 2,000,000 lb., averaging about 30% monazite. The grade of this sand was so variable and the prices realized on different lots were so irregular that cleaned sand has been used as an estimate of the

ACCOUNT					SHEET No.		
DATE	DEBIT				ITEM	CREDIT	
	Labor	Supplies	Desc.	Total		Desc.	Amount

Fig. 10.

Form C.

BOOKKEEPER'S DAILY REPORT.

Mining Co.

Date

190

	Management.								General expense.								Total.	
	Office expense.		Traveling expense.		Salaries.		Livery.		Assaying.		Surveying.		Legal expense.		Stable expense.			
	No.	Cost.	No.	Cost.	No.	Cost.	No.	Cost.	No.	Cost.	No.	Cost.	No.	Cost.	No.	Cost.	No.	Cost.
Superintendent.....																		
Bookkeeper																		
Assayer																		
Surveyor.....																		
Teamster.....																		
Total																		

Stationery

Telephone

Telegrams.....

Papers

Lights

Water

Feed

Chemicals.....

Coke

Crucibles.....

Fig. 6.

appropriate of these names is diatomaceous earth, as the material is composed almost entirely of the skeletons of diatoms—one-celled plants that adapt themselves to a wide range of conditions of depth and temperature in fresh or salt water and secrete silicious casings around their organic matter. They must have lived in great abundance in the sea that ages ago covered this part of the land, for the rock was built up of the little shells of these plants that dropped to the sea bottom. Examination with a hand lens always reveals a large number of the round forms of the diatom shells thickly imbedded in the shale. Many of these shells are in a good state of preservation, and in some of the material they can be plainly distinguished with the naked eye. The name

quantity of monazite produced, an additional reason for so doing being furnished by the fact that the greater part of the crude material is cleaned by local mills before shipment, and the grade brought up to 80% or more of monazite. On a basis of 80% production, North Carolina produced 697,275 lb. of the mineral, valued at \$125,510; and South Carolina 148,900 lb., valued at \$26,802; the total for the United States amounted to \$16,175 lb., valued at \$152,312. The production for 1905 amounted to 1,352,118 lb., valued at \$163,408. This amount represented in part crude and in part cleaned sand—a fact that explains the increase in quantity without corresponding increase in value. The zircon produced in 1905 amounted to 1,100 lb., valued at \$218.

The Genesis of Ores.

By HORACE V. WINCHELL.

*Antecedent to every great achievement is a theory or mental conception. Powerful imaginations lead to epoch-making events and discoveries, if to the dreamer is given also the faculty of creating and developing. This is true not alone of mechanical inventions and of processes of commercial importance; but in the elucidation of scientific problems and theories. These new ideas are often received with skepticism and incredulity when first announced; and in many instances have been neglected and forgotten for years, only to be revived at a later date and given general acceptance. From this we should not conclude that every novel theory is worthy of credence and liable to revolutionize matters in its own particular sphere. The true scientist will always maintain a receptive mind ready to advance with the progress of real discovery and the growth of knowledge, be it fast or slow. Indeed, there has been great improvement in regard to this point with the spreading of education; and while the true is more readily distinguished from the false and improbable, there is also greater tolerance and more reasonable and careful consideration of the newer and more advanced theories of mankind than they have ever before received; and substantial progress is increasingly more rapid along all the avenues leading to a more perfect comprehension of our universe.

It has seemed to me fitting on this occasion to sketch an outline of the prevalent modern theories of the genesis of ore deposits, laying special emphasis on some portions of the theory which appear to have received less attention than they perhaps deserve, and which have perhaps not all been incorporated in text-books. It is well understood but often forgotten that all of the constituents of ore deposits are found in some form in the earth's crust, contained in more or less abundance in the rocks, especially in the eruptive rocks; and that they have been in some way collected from their disseminated condition in these rocks, and concentrated in veins, beds, or other deposits.

Analyses of fresh eruptive rocks have demonstrated the existence therein of all of the ingredients of our valuable ores and their compounds. Few of them occur native like gold, silver, copper, and platinum; often, because of their minute quantity and fine state of subdivision, it is not possible to determine the precise form in which they are present. The presence of sulphur, arsenic, antimony, and tellurium indicates that there may be many metallic combinations in the eruptive magmas similar to those formed at later periods, nearer the surface.

The average composition of the earth's crust has been approximately estimated as follows:†

	Per cent.		Per cent.
Oxygen.....	47.13	Phosphorus.....	0.09
Silicon.....	27.89	Manganese.....	0.07
Aluminum.....	8.13	Sulphur.....	0.06
Iron.....	4.71	Barium.....	0.01
Calcium.....	3.53	Chromium.....	0.01
Magnesium.....	2.61	Nickel.....	0.01
Potassium.....	2.35	Strontium.....	0.01
Sodium.....	2.68	Lithium.....	0.01
Titanium.....	0.32	Chlorine.....	0.01
Hydrogen.....	0.17	Fluorine.....	0.01
Carbon.....	0.13		
		Total.....	100.00

Copper, lead, zinc, tin, silver, and gold, although metals of great importance to man, constitute so small a part that their percentages are expressed by four to eight decimals, that is between hundred thousandths and billionths of a per cent. In some eruptive rocks, however, the per-

centage is much higher, and has been determined to be in the thousandths of a per cent in the case of copper, lead, and zinc, and one tenth to one hundredth as much of silver and gold.

The amount of metallic content found to occur as a primary constituent in unaltered rock is thus seen to be far too small to constitute workable ore, and indeed is often so insignificant as to be determined with difficulty. You all know that several per cent of iron, manganese, zinc, lead, and copper are required to make an ore valuable, the percentage varying, of course, with the locality, complexity of the ore, and other familiar factors. It is therefore apparent that a process of natural concentration is essential for the production of ore deposits, bringing into limited space the material formerly disseminated through 10,000 or 100,000 times that extent of ground, or accomplishing the same result by the removal of the admingled rock impurities. Wherever this concentration is brought about by assembling of solid particles under conditions that admit of freedom of movement we have placer deposits, as of gold and platinum, iron and chromium ores, and sometimes of precious stones, such as diamonds, sapphires, rubies, garnets, and others.

The ores found in veins in disseminations throughout the rocks, and in irregular shaped deposits in soluble rocks cannot have been collected in any such manner. Their mode of occurrence and relation to the enclosing rocks, make it evident that they have been slowly deposited from solution. And the only solvent of general distribution is water, with its varying content of acids and alkalies under changing conditions as to temperature and pressure.

Water is the magic instrument by which all the copper in Butte's vast mines, all the gold and silver of the Comstock and of Goldfield were assembled. More potent than the philosopher's stone, more universal than the air we breathe, constantly at work, dissolving, transporting, and re-depositing. With indefatigable zeal and never-flagging industry it searches through the innermost recesses and penetrates the most closely locked chambers of the rocks, removing treasures through their very walls, and often repairing breaches made in the attack so skillfully as to defy detection, or to make the masonry stronger than when first laid. Small wonder that the ancients regarded it as one of the four prime elements.

But, although for several years water has been recognized as the great agent in the formation of ore deposits, geologists are not agreed as to the source of this water, the conditions under which it is most effective, nor the relative importance of its work in ascending and descending movements.

Regarding its source, we have those who believe with John Woodward, Franz Posejany, and C. R. Van Hise, that the water in the uppermost layers or outer zone of the earth, including the water on the surface and in the atmosphere, accomplishes the formation of ore by means of a perpetual circulation. From the air it falls on the earth as rain; through crevices and fractures it enters the rocks by reason of its head or the weight of more water on top of it, and finds its way deeper and deeper to the very lowest point where the density of the rocks will permit it to penetrate. Down to this depth, which is theoretically not more than five or six miles, the temperature has been constantly increasing, and the water by reason of this higher temperature has been gaining strength as a solvent and picking up alkalies or acids that enable it to hold even the most difficultly soluble substances in solution. Finding no escape downward, and urged on by cooler and heavier waters above, these saturated solutions begin to move laterally and upward, expanding and becoming

*Commencement address delivered before the Montana School of Mines on June 5, 1907.
†P. W. Clarke in Bulletin No. 148, U. S. G. S., p. 13.
J. F. Kemp in *Economic Geology*, Vol. 1, Part 3, p. 210.

of lower specific gravity because of the forced deposition of dissolved material as they become super-saturated. Following the directions of least resistance, these metal-carriers reach the surface as hot springs or geysers through fractures caused by earth movements. Gradually the walls of these fractures become coated with vein-minerals and ores, until the waters stop flowing or the fracture is healed and a vein is formed.

Then there are those like Vogt, Spurr, Weed, and Kemp, who maintain that the chief source of underground waters is the unconsolidated magma of molten lava within the earth. These authorities point to the immense volumes of steam emitted from volcanoes; they call attention to the conclusions of European scientists, who have decided that many of the hot springs cannot be derived from meteoric waters heated and returned to the surface; they remind us that there is so much watery vapor derived from lavas that possibly the oceans themselves were formed from volcanic emissions. They point out the ease with which such waters, thus derived and so heated, could gather metallic substances at great depths and bring them to the places where they are now found. They mention the fact that there is a general association between the more important mining regions and eruptive rocks; and they raise several serious objections to the premises of the disciples of the meteoric water school.

On this particular point we shall not dwell further; it is quite probable that both theories contain elements of truth; and that ore deposits have been formed by both magmatic and meteoric re-ascending waters. It is even possible in some cases to determine by the character of the minerals the origin and nature of the causative solutions.

As to the relative importance of the work of ascending and descending waters there is also divergence of opinion. There are few who still doubt the agency of descending waters in the formation of the oxidized ores, such as carbonates, silicates, and oxides of copper (as also the native metal in some instances), in the superficial or shallow alteration of sulphides, arsenides, or antimonides. The iron ores of the Lake Superior region, for example, are generally believed to owe their concentration to descending solutions; in this respect differing from many of the Scandinavian iron ores, according to recent descriptions.

It is not, however, the oxidized or 'dry' ores alone that are now believed to owe their formation in large part to the action of descending waters; but the 'base' ores consisting of chemical combination of the metals with sulphur, arsenic, antimony, tellurium, and some rarer elements. It is only within the past decade that it has been considered possible that the sulphide minerals are produced by reaction between sulphate or carbonate solutions and undecomposed sulphides or other minerals found in veins. Laboratory experiments have, however, shown that the operation is not only possible, but easily accomplished and duplicated under normal conditions as to temperature and pressure.* This is a fact of great importance and wide significance, for it aids in the explanation of many formerly puzzling phenomena of mines and mining geology.

It has long been noticed by the students of ore deposits that by far the greater number of mines become exhausted at comparatively shallow depths; that veins, instead of continuing downward uniform in size and composition, like dikes of diabase and porphyry, become smaller and of lower value with depth, and often disappear altogether. It is noticed also that the shape of many ore deposits, and the distribution and paragenesis of the

minerals which they contain, can often be better explained on the theory of descending than of ascending mineralizers. Moreover, it is apparent that there are changes constantly in progress in those portions of sulphide orebodies lying nearest the surface of the ground. These changes consist in the oxidation of the sulphides and their solution as sulphates. These sulphate solutions percolate downward into the veins or rocks below along the most open channels; and thus, by degrees, the upper zone of the vein is robbed of most or all of its sulphide minerals, and only a gossan or iron cap remains.

The process of oxidizing and leaching of the sulphides in the superficial zone of ore deposits tends, first of all, to disguise the nature of the unaltered ore below. In many instances the ore discovered by the outcroppings is gold ore; and gold mills are often erected and operated for years upon such ore, without a suspicion arising that extensive bodies of copper or lead sulphides occur at greater depths. Such was indeed the history of Leadville, Colorado, of Bingham, Utah, of Ely, Nevada, and of Mount Morgau (Australia). The last is one of the world's greatest gold mines; yet it is now producing copper from its lower levels; and developments have proved it to be a great copper mine. Immense low-grade deposits of copper ore are found below the gossan at Ely and at Bingham, although it is doubtful whether the most experienced geologist or keenest observer of mineralization phenomena would in either place have felt justified in predicting the existence of the wealth below.

In other localities the metals have either all been removed, or else the primary sulphide ore was too poor in gold to leave oxidized ore of any value. In such cases the discovery of the subterranean treasures is purely fortuitous. Butte may be considered the most conspicuous example of this class. The outcrops of its copper veins contain the merest traces of that metal; and there is seldom enough silver or gold in them to justify mining even under the low costs obtaining here today. The zone of oxidation is generally from 100 to 200 ft. deep; and if it had not been for the presence of another system of veins carrying silver, of different age and origin, but closely associated with the copper lodes, this greatest of copper districts might not yet have been discovered. It was in the search for silver ore that copper ore was discovered here, and one cannot help wondering how many more districts equal to Butte may be undiscovered and unsuspected where no outcropping silver or gold lodes attract the prospector. Here is surely an important and unexplored field for the geologist. The study of oxidized vein phenomena may yield results thoroughly satisfactory from both the material and the scientific point of view.

Below the zone of oxidation the chemical reactions that take place between the descending acid solutions and the unoxidized ores result in the formation of more and richer sulphides, down at least to the level of the lower limit of free circulation, and as far as surface waters penetrate. And as erosion of the surface is continually bringing deeper and deeper sulphides within the reach of oxidizing and dissolving surface waters the operation is in constant progress, and these lower-lying ores become more and more enriched until in some cases bonanzas of almost inestimable value are formed. It is a fact of much significance that bonanzas are generally limited to depths where descending waters may have penetrated at one time or another. Indeed, the very channels through which the enriching solutions came can often be detected, and peculiarities of shape and position observed that can be explained with difficulty on any other theory.

* H. V. Winchell, 'The Synthesis of Chalcocite,' *Bulletin Geological Society of America*, 1903.

Practiced miners often point to the richness of ore-shoots near the junction or crossing of veins. Indeed, such pockets and shoots are usually sought and frequently found where two veins come together. This fact alone may not signify the instrumentality of downward-moving waters. But when in connection with it we discover that rich ore-shoots are also frequently found at the intersection of veins by faults, and zones of movement so recent or of such shallow depth or limited extent that the faults themselves are not veins, and have not been mineralized except near the intersected veins, and when the ore-shoots thus formed occur on that side of the fault-plane where they could have been formed most naturally by descending waters, and are wanting entirely in the corresponding place on the other side, then indeed, we recognize beyond a doubt the agency of meteoric waters in both situations. It is often possible where sulphide ores have been deposited in soluble rocks to distinguish between the products of ascension and descension, and here too the latter are frequently of much the highest grade.

This theory of secondary enrichment, which is so frequently referred to in recent mining literature, and is still so little understood, depends, of course, on the existence of a body of primary ore, probably formed by ascending solutions. If there are no ores to be oxidized, the downward-moving waters will have no metalliferous burden to deposit. But wherever the rocks contain disseminated ore, no matter how small the percentage, there is a possibility of the formation of richer ore through the action of surface waters; and where the primary mineralization was itself comparatively rich, even though not a minable product, there the downward-moving waters may the more readily bring about concentrations of high-grade bonanza ore.

Bearing in mind this conception of the meaning of 'secondary enrichment,' and admitting that it is frequently accomplished through the agency of descending meteoric waters, let us briefly consider the conditions under which they are most active and efficient: It is a proposition requiring no argument that if by the aid of mineral-bearing solutions the ores occurring in veins are to be enriched, these solutions must enter the veins. And if all the meteoric waters that fall upon the outcrop of a vein, or upon rocks containing disseminated ore, run off rapidly down the mountain-side without remaining to oxidize, dissolve, and penetrate the vein with their load of mineral, there cannot be any enrichment caused thereby. Furthermore, if the work of the surface waters is chiefly destructive mechanically instead of chemically, there will be little opportunity for the deposition of secondary concentrations of ores within the rocks. If, for example, the principal effect of the rains and snows is to erode and wash away the exposed portions of veins with all their contained ores, there will be a scattering and wasting instead of an assembling and storing. In other words, secondary enrichment by descending waters depends first of all upon the ratio of oxidation to erosion. Where erosion is more rapid than oxidation the unoxidized sulphides will be found in the rocks and veins at the surface of the ground and in the sand rolling down the beds of torrential streams as in Alaska. While, if oxidation precedes erosion, the uppermost zone of a sulphide ore deposit will be oxidized and leached off its base minerals, as is the case here in Butte, and to varying extent over the larger portion of the temperate zones of the earth. Assuming that the conditions are such as to permit the entrance of surface waters, and that the ground-water level is at some depth, which depth naturally varies from year to year and age to age because of many common geological conditions, the factors upon

which depend the extent of secondary enrichment are:

1. Quantity of water.
2. Time.
3. Temperature.
4. The physical structure and solubility of the rock containing the primary ore, and of the ore itself.

It is manifest that a large supply of mineralizing solution will accomplish greater results than a small supply, provided it follows the course of the ore. For the metals in solution can hardly escape precipitation by reaction with the primary sulphides present, sooner or later, at some depth; and the oxidizing and dissolving effects will certainly increase with the amount of active oxygen-bearing moisture available. In regions of slight rainfall there may be partial oxidation to the depth of several hundred feet; and yet there may still remain particles of the primary sulphides upon the very surface of the rocks. Chemical activity is great; but the thirsty rocks quickly absorb that part of the water of rains and melting snows which is not evaporated, and the work of oxidation is not so complete as in regions more plentifully supplied with rain. On the other hand, there may be such heavy and constant downpourings of rain, even in tropical regions, that erosion is again the most active agent.

The second of our factors is Time; a commodity of which the geologist is accustomed to make most liberal and even extravagant use in his arguments and theories. In this he is frequently justified; and the most astonishing results may be produced by the long continued but slow operation of natural forces in any given direction. Events of the past few years have, however, reminded us forcibly that catastrophic phenomena must not be forgotten in comprehensive reviews of the earth's history.

The time element enters in a variety of ways into the problem of ore formation by descending circulations. Thus, an ore deposit formed in its primary low-grade constitution during earlier geological periods, such as the Cambrian or Huronian, and during all of the subsequent ages exposed to the action of superficial agencies unhampered by subsequent covering of later rocks, has a thousand-fold the opportunity for concentration of its ores that is presented by similar rocks and ores formed during later geological epochs, say the Tertiary. This is exemplified by the iron ores of the Mesabi range as contrasted with the glauconitic deposits of New Jersey or Texas. During almost all the ages since the Cambrian the iron ore formation of the Mesabi has been exposed to the weather, covered only for a geological moment during a part of Cretaceous time. The result is the largest and purest deposits of iron ore ever discovered, while rocks of similar composition but much more recent formation exhibit only the initial stages of ore formation.

Another way in which time affects ore deposition is in connection with the rate at which the waters move in a vein. Solutions of a given composition may move so rapidly as to produce but little effect, or may move so slowly that they clog up or retard other active waters after their own power is exhausted. Upon a steep drainage slope or mountain the waters may pass off so rapidly, even below the actual top of the ground, as to exert but little influence, or they may move with just sufficient rapidity to accomplish their maximum of chemical effect.

Our third factor, Temperature, is of great importance. In the first place, oxidation, which is but another name for combustion, is greatly accelerated or retarded by slight changes in temperature. Sulphides that remain immersed for centuries in water under a glacier in Alaska

would be completely oxidized in a few years exposed to the heat of the sun on a southern slope in Colorado or California. In the next place, the rate of solution depends directly upon temperature, increasing as the temperature rises, and, itself a process of heat consumption, is greatly facilitated by heat from external sources. Thus in warm rocks, in mild climates, upon the sunny side of mountains, there will be the most favorable conditions as regards temperature, for the formation of secondarily enriched ore deposits. The experienced prospector will tell you that it is in precisely these localities that they are found; although he never before heard any explanation for it.

Lastly, the physical structure and solubility of the rocks and ores effect their susceptibility to later enrichment for perfectly obvious reasons. A dense rock is not readily entered by mineralizing solutions. Likewise an insoluble one is not easily replaced and does not afford lodgment for ores. And if the ores themselves are not readily attacked by oxidation or by solvents, the quantity, time, and temperature may all be sufficient to accomplish great results with more tractable ores, but have practically no effect upon these refractory ones. A good example of this again is found on the Mesabi range where the heat of an eruptive rock has so altered a portion of the iron formation for many miles that it has resisted surface solution and concentration, and is a worthless low-grade mixture of rock and magnetic ore still; while away from the influence of the eruptive, have been formed the iron ore deposits that have given to the iron and steel industry of this country the raw material required to enable us to control the markets of the world.

Reduced to more simple language and ideas the foregoing remarks amount to a statement that climate, sun, rain, average temperature, topography, depth of soil or surface, debris, erosion, glaciation, and other common and often unobserved influences and conditions have decided bearing upon the important question of ore formation.

These are the phases of our modern theory that have received little attention hitherto; and are yet of a practical value that can hardly be overestimated. We find few bonanzas of high-grade ore in Siberia, Russia, Alaska, British Columbia, Washington, or northern Ontario. Our theory tells us why they are not to be expected, and why such enriched ores as are found seldom extend downward to great depths. We turn to regions of milder climate, less glaciation, gentler topography, and we find the rocks altered and softened and oxidized to some depth below the surface. We find that the veins wear 'iron hats'; and beneath them we find bonanzas reaching to great depths. We find our best ore-shoots on the sunny sides of the mountains, while the veins on the northern or shaded sides, where the snow lies till mid-summer and the rocks are cold, produce no such rich ore. We begin to realize that our theory is based on fact and proved by observation; and that it justifies us in placing confidence in it, and in acting upon it within reasonable limits. And we marvel that facts so simple and of such easy comprehension and yet of such practical value should receive so little attention from the writers on ore deposits.

LOW-GRADE IRON ORES.—Someone in Christiania, Norway, has invented a system of treating low-grade iron ores in an electric smelter, with graphite as a reducing medium instead of coal, and he has been awarded a prize for the invention by the Iron & Steel Institute. There are large quantities of graphite and of low-grade ores in Norway, and the existence of water-power makes the invention a valuable one if it can be worked on a large scale.

The Leadville Downtown District.

High up among the peaks of the Front range of the Rocky Mountains in Colorado, more than 10,000 ft. above the sea, in a terraced basin at the very head of the great Arkansas river, stands the city of Leadville, covering with its rectangular system of streets and contiguous smelting works an area of over 500 acres. On the hill-slopes back of the city are the mines, which since 1860 have year by year added immense amounts to the world's metallic wealth. In the early eighties it was estimated that this district's annual product of silver alone exceeded that of any silver-producing country in the world except Mexico, while its lead product nearly equalled that of England and was surpassed only by that of Spain and that of Germany—all mined from an area not over a square mile in extent. Today—more than twenty years later—the Leadville district is still a marvel in its metallic production. In 1906 its mineral product, overpassing all its own previous records as well as those of every other mining district in Colorado, amounted to nearly a million tons of ore. Zinc, silver, lead, gold, and copper, in the order named, to the value of over \$15,000,000, were dug from these treasure-holding hills, whose store of mineral wealth is still apparently inexhaustible. It is a notable fact that zinc, once despised by the miners, now leads in value.

The history of the discovery and development of the Leadville ores has been told many times, but its interest may justify a brief statement. Gold was discovered in California gulch on April 26, 1860, and the news spread with amazing rapidity, notwithstanding the difficulties of communication in this wild and inaccessible region. In three months over 10,000 persons were in the camp, and it is said that over \$2,000,000 were taken out during the first summer. The climax was soon reached, however, and within three or four years the population was counted by hundreds instead of thousands. In 1874 the now famous carbonate deposits were discovered. The first smelting furnace was erected in 1877, and the subsequent growth of the city has kept pace with the development of the region. The most notable recent undertaking in the district is the wonderful Yak tunnel, probably the greatest mining enterprise in the United States. The works already comprise a main adit from which extend miles of laterals, provided with electric lights and telephones and equipped to handle 1,000 tons of ore per day.

Early in 1880 the United States Geological Survey, then but a year old, sent to Leadville a party of geologists and topographers, headed by S. F. Emmons, to study and map the district. A preliminary report of this investigation was published in 1882 and an extended report was issued four years later.

At the close of the Survey field work in 1881 underground exploration was practically confined to a zone about 1,000 ft. wide along the eastern or upper edge of the camp. Within recent years mining operations have been carried westward under the city into what is called the Downtown district, and revised and extended maps of the whole district, showing underground workings, are now being prepared for publication. In advance of this publication a description of the Downtown district, accompanied by maps and sections, has been issued by the Survey as Bulletin No. 320. The data for this bulletin were obtained principally by personal explorations made by its authors, S. F. Emmons, the writer of the original reports, and J. D. Irving. This preliminary report is published now partly because the information is needed for immediate use by those engaged in mining in Leadville, partly because it is hoped that it will bring out criticisms which will be available in time to correct any errors before the publication of the new general map.

Silver-Lead Smelting Practice.—V.

By T. S. AUSTIN.

Edited for the MINING AND SCIENTIFIC PRESS
By L. S. AUSTIN.

***ROASTING.**—My observation has been that roasting is left very much to chance in large plants, and the reverberatory has been retained only because its defects are the cause of its good work, that defect being the absence of all mechanical assistance in handling the ore. My opinion of the Bruckner cylinder is that it requires very close watching and careful management, and this it does not get under ordinary circumstances and in plants of large size, where the superintendent cannot give close supervision to all details. I do not think the Grant works made their success metallurgically by their reverberatory roasting furnaces. They probably made it by handling roasting ores, and had to have a large roasting plant to do it. Of course, it is better to mix roasting ores so as to have a combination that will be constant in composition, and, if you receive various kinds of ore, you can do this. Pyrite helps in the roasting of both arsenic and blende ores; lead tends to agglomerate the charge, silica to decompose the sulphates.

FURNACE GASES.—When working with good reduction on the slag (with the lead under 1%) I have got 14 to 16% CO₂ and 8% CO, by volume. My experiments were more extended at Monterrey, and I had wide ranges in my results. Often the CO was nearly equal to the CO₂, there being 12 to 14% each. I have seen cases where the CO₂ was 20% and the CO only 6%, but this was rare, and I do not recall how the other conditions of the furnace were. I am inclined to think that the ratio of two CO₂ to one CO is about the point of good reduction.

SUCCESSFUL RUNNING OF SILVER-LEAD BLAST-FURNACES.—[Speaking of a patented fore-hearth, which had been successful on a basic slag, he predicted its failure where used for stiff blende slags, or for silicious limy ones, in fact, for conditions under which customs smelters have to run. He judged, from conversations, that the inventor was more practical than theoretical, and not very practical either, in handling ores of different kinds. Leadville smelting had made many men think they are metallurgists who had no claim to the title. Farther he adds:] I still pay a great deal of attention to the furnace running, for it is there that success depends. [He repeated this to me in 1902.] A foreman can handle men, even manage to keep the furnace in good condition but he cannot smelt. His knowledge is not enough to grasp the whole situation. Only a superintendent or metallurgist can do this, as he knows all the conditions that are entering into the problem. If I had it so that I could run with large batches and few charges, I could bring losses down to about *nil*. As it is, I can reduce them to 2% of the silver and 5% of the lead. My silvers rarely get over two ounces on the highest bullion I can make. I am now making on one furnace a half-slag, Pb 0.6 to 0.8%, Ag 0.6 to 0.8 oz. per ton, producing 180 to 200 oz. base bullion [this was before the day of large fore-hearths], using 13% of Trinidad coke and 2.5% charcoal. I run my regular three-quarter slag on the other furnaces, using between 17 and 18% fuel on the 42 by

120-in. furnace. My slags run, if of this type, about 0.5 oz. Ag for every 100 oz. contained in the base bullion.

SILVER-LEAD SMELTING AT EL PASO.—The system of getting Mexican ores part in bond, part free, with American free ores precludes the possibility of large mixes, as these different kinds of ore must be kept separate. This entails an immense amount of labor in handling, as well as great confusion at scales and elevators, frequent changes of charges, and a lot of minor inconveniences. The bad draft of the big stack and flue system (in 1897) makes it hard to regulate feeding, as the smoke passes out as soon as the door is opened. The furnaces, except one recently designed and put in by Mr. A. S. Dwight, are antiquated and ill-designed for good reduction. The ore is coarse, and it is hard to pack the furnaces. Still I have knocked 10 to 15% out of the mattes and largely reduced their silver tenor from what it was. With good conditions of furnaces, there is no reason why better work cannot be done. At any rate I hope to greatly better it. I am using a good deal of scrap iron—10 to 20 lb. per charge—as an assister of reduction. Slags are clean enough, but the mattes are strangely high. I have never, anywhere, had trouble in making 10 to 12% lead-mattes; here they are good at 20 per cent.

[Six months later than when these observations were made, he was able to say:] Matters are going nicely here. In fact, it is quite the custom for them to go so, even with our old-style furnaces. There is a variety of conditions, however, even in the months themselves. However, the work metallurgically shows a much greater evenness than it formerly did when I commenced, owing to a better understanding of the ores. Our work (in roasting) is often unsatisfactory, owing to varying conditions of both ore and matte. Arsenic is troublesome, and the granulated matte (no matter how low in lead) is hard to roast, as it develops a great tendency to agglomerate.

METAMORPHISM OF COAL.—At a small town called La Brea, in Sonora, Mexico, situated about 65 miles southeast of Torres on the Sonora branch of the Northern Pacific from Nogales to Guaymas, there is anthracite coal and natural coke. On looking over the outcrop, the only indication of coal is a gray clay, which on closer inspection proves to be ashes from burnt coal; below these ashes comes the natural coke, heavy in ash, although it will burn with a forced draft. Some of the veins are 10 ft. thick and extend down to nearly 100 ft.; beneath the coke is anthracite coal of fine quality as far as analysis goes, but it slacks on exposure to the air. Apparently the coal measures were ruptured by a volcanic eruption, and the molten rock, on reaching the outcrop of the coal vein, burnt the coal to an ash where it had plenty of oxygen; when it did not have oxygen, it had the same effect as if placed in a coal-kiln. The pressure and heat changed the coal from bituminous to anthracite. Situated in this coal-field is the shaft of the old Tamorarra copper and silver mine, 500 ft. deep in the eruptive rocks covering the coal measures. The copper and silver vein penetrates this eruptive, and on sinking the shaft, they encountered one of the coal seams, the coal being used in boilers for roasting, etc., in a chlorination plant.

*These observations of T. S. Austin, recently deceased, general superintendent of the Southern Department of the American Smelting & Refining Co., are compiled from letters written by him to his brother, from 1883 to 1906, covering most of the period of his wide experience in silver-lead smelting, and to some extent that in base-bullion refining. They lack some of his recent experience, but show that much of his knowledge had been brought into finished form some time before his death. The notes refer largely to his work at Socorro, New Mexico, Monterrey and Chihuahua, Mexico, and to El Paso, Texas, together with other technical observations made during that time. Professor L. S. Austin's remarks are in brackets. The first of this series appeared in our issues of February 23, March 16, April 27, and June 15.

The wages of the coal miners of England and Wales was increased by 5 per cent from the first of May. This applies to all underground labor and to the wages of surface labor engaged on the pit banks and screens in manipulating the coal. This will be the second advance of 5 per cent this year, the previous one going into effect on the first making-up day in January.

The Prospector.

Enquiries sent to this department are answered free of charge. If submitted by subscribers who are not in arrears. The full name and post-office address of the sender must be given, otherwise no answer will be made. Those who are not subscribers must accompany their questions with a fee of \$3 for each question. No assays are made.

A fragment of Gabbro was sent from Sheridan, Mont., by H. G. D.

Four specimens of Dacite were sent by O. U. B. from Wonder, Nevada.

P. H. B. sent a specimen of specular Hematite from Wickenburg, Arizona.

The rock sent by E. P. D., from Rosa Morada, Mexico, is an altered Andesite.

The specimens sent by J. A. P. from Fairview, Nev., have not been received.

A specimen of Chalcedony, lined with drusy quartz, was sent from Michigan Bluff, Cal., by J. A. S.

The mineral Hübnerite, which is a tungstate of manganese, was sent from Pioche, Nev., by J. W. A.

The rocks sent by H. G. G., of Wonder, Nev., are: No. 3, Dacite; No. 4, Dacite; No. 5, Dacite; No. 6, Rhyolite; No. 7, Dacite.

The rock specimens sent from Seven Troughs, Nevada, by F. D. B. are: No. 1, Rhyolite; No. 2, Rhyolite; No. 3, Rhyolite Tuff; No. 4, Dacite; No. 5, Basalt; No. 6, Dacite.

B. R., of Hawthorne, Nev., sends: No. 1, Calcite and Siderite; No. 2, Grossularite and Quartz; No. 3, Quartz; No. 4, Basalt; No. 5, Basalt; No. 6, Basalt; No. 7, Basalt; No. 8, Rhyolite; No. 9, Rhyolite; No. 10, Andesite.

Making an Artesian Well Pump Itself.

The field men of the United States Geological Survey, in their investigations of the ground-water resources of the Virginia coastal plain, have observed that the flows from many artesian wells in that neighborhood are utilized to drive hydraulic rams for the purpose of lifting water to the higher levels. Along the lower courses of the Potomac and Rappahannock and along the shores of the many inlets that run back from Chesapeake bay above the James, there are hundreds of artesian wells that supply a perennial flow of beautifully clear water which is, as a rule, excellently adapted to all domestic uses and is largely utilized by the canning factories and other industrial establishments that abound in that part of the country. Though the pressure of the water from the wells is ample at the shore level, the head diminishes so quickly with increase in elevation that no flow can be obtained along the higher banks above the shores, where the water is most needed. The common method of obtaining it at these higher levels is to use the force developed by the artesian flow to operate hydraulic rams, which in turn raise the water to the heights desired along the bluffs above the rivers and inlets. Thus it may be said that the artesian wells pump themselves.

SOUTH WALES COAL, according to report, is no longer being purchased largely in the Cape Colony in South Africa, as Natal coal is taking its place, due to the preferential treatment of the Natal product.

Decisions Relating to Mining.

Specially Reported for the MINING AND SCIENTIFIC PRESS.

Under the statute of Colorado a person who flowed water from his mine into a natural stream with the intention of appropriating it for irrigation purposes, and he did actually make the first appropriation thereof, was entitled to such water as a first appropriator.

Ripley v. Park Center Land &c. Co. (Colo.), 90 Pac. 75. (May '07.)

Where no place was specified for the payment of royalties in a coal lease, they must be demanded on the premises before there can be any forfeiture for the non-payment.

Drake v. Penn. Coal Co. (Pa.), 66 Atl. 660. (April '07.)

An agent appointed to care for mining property and its title for a corporation of which he was a stockholder, and to accept service of process, but was given no funds to pay taxes or other expenses, and was without authority to advance money for the corporation after repeated notices by him to such owner that taxes were due, that the property had been advertised for sale at tax sale, was held to have the right to bid in a part of the property after most of it had been sold for taxes, and thereafter obtained a tax deed and thereupon notified the corporation, offering to convey if it would reimburse him, and subsequently sold the property which was then wholly unproductive. The original owner was held not entitled to recover the property six years later after valuable ore had been discovered.

Steinbeck v. Bon Homme Co., 152 Fed. 333. (March, '07.)

The owner of the mineral estate may by contract with the owner of the surface relieve himself from the duty of supporting the surface, and from all liability for any injury done to it by mining and removing the minerals from the mine below.

Miles v. Penn. Coal Co. (Pa.), 66 Atl. 764. (April, '07.)

A miner, while attempting to remove a car which had been stopped by reason of a defect in the track, was run into and injured by another car which the foreman of the mine was pushing along the same track. It was held that the defect in the track was the proximate cause of the injury and not the act of the foreman, and that the mine owner could not escape liability on the ground that the accident was so remote a consequence of the defect as not to be expected with any degree of reason.

Moore v. Royal Lead &c. Co. (Kans. App.), 102 S. W. 616. (May, '07.)

Under the Illinois statute the operator of a coal mine is required to provide miners with a sufficient supply of props, caps, and timber on demand, and this duty is not discharged by the operator furnishing such props, etc., as he himself deems sufficient, but he must furnish any particular kind on a reasonable and timely demand by a miner.

Springfield Co. v. Gedutis (Ill.), 81 N. E. 9. (April, '07.)

In an action for the death of a miner caused by the falling of the roof of the mine where he was working, and based on the failure of the operator of the mine to furnish proper supports, it was held that a witness who went to the place just after the accident could testify as to what crossbars there were in the room.

Springfield Co. v. Gedutis (Ill.), 81 N. E. 9. (April, '07.)

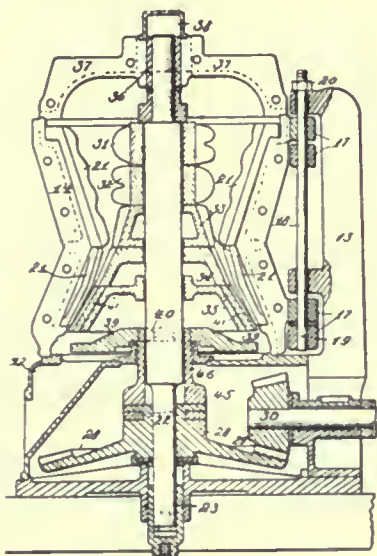
A miner who went from his usual place of work in the mine to another part of the mine to get some tools he had formerly loaned to another employee, assumed the risk incident to the place to which he went, and was not entitled to recover for injuries occasioned by the falling of slate from the roof of that part of the mine.

Pioneer Min. &c. Co. v. Talley (Ala.), 43 So. 800. (May, '07.)

MINING AND METALLURGICAL PATENTS.

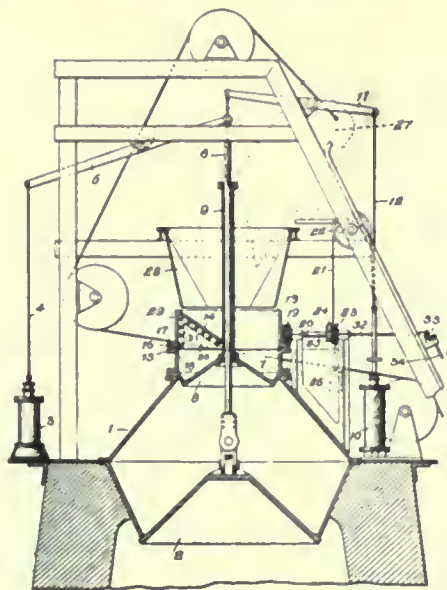
Specially reported for the MINING AND SCIENTIFIC PRESS.

CRUSHING AND GRINDING MILL.—No. 857,121; Thomas L. Sturtevant, Quincy, and Thomas J. Sturtevant, Wellesley, Mass., assignors to Sturtevant Mill Co., Portland, Me., a corporation of Maine.



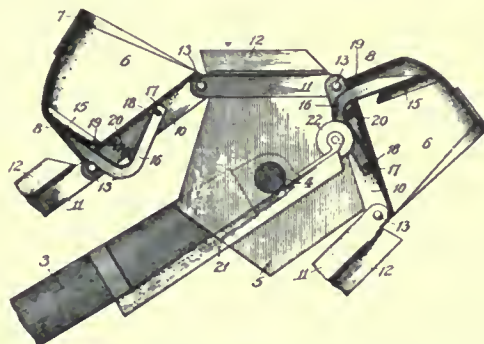
In a vertical crushing and grinding mill, the combination with a suitable base, of a vertical post or standard, a casing comprising two parts which are vertically hinged to said post or standard and which rest on and are secured to said base when in closed or working position, said casing parts being formed independent of said post or standard and being thus adapted to be loosened or swung aside horizontally and simultaneously to relieve clogging of the mill or when access to the chamber of the mill is desired, normally stationary or non-rotary crushing elements mounted on said hinged casing parts, a vertical shaft within said casing, and rotating crushing elements mounted on said shaft and which may be removed from said shaft, without taking the latter out of the mill, when said casing parts are swung aside.

BLAST-FURNACE CHARGING APPARATUS.—No. 857,259; Charles H. Sample, Homestead, Pa., assignor to Walter Kennedy, Bellevue, Pennsylvania.



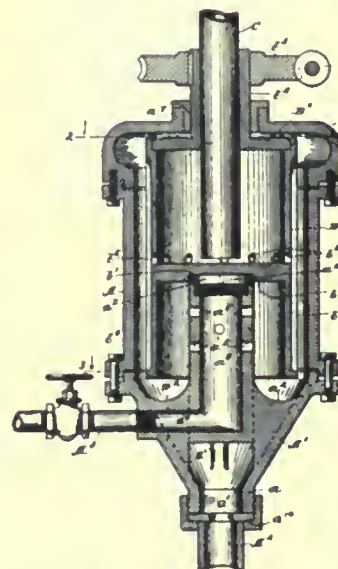
A blast-furnace charging apparatus having in combination a main hopper and bell, a bell at the upper end of the main hopper, a movable shell above and movable around the axis of the upper bell and provided with an eccentric discharge opening, and means for shifting said shell.

DREDGE-BUCKET.—No. 857,396; Isaac B. Hammond, Portland, Oregon.



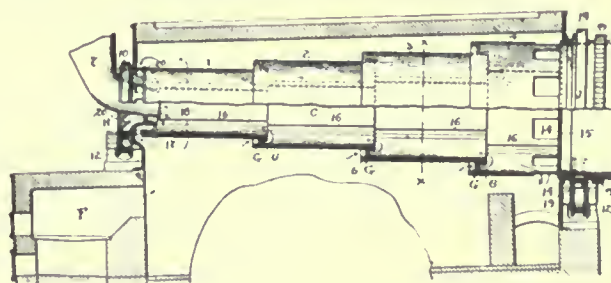
In a dredge, the combination with a traveling bucket formed with an outwardly-flaring surrounding wall, of a bodily-movable, bucket-contents loosening, plunger in the base-portion of the bucket surrounded by said wall, an actuating lever for the plunger carried by the bucket, and a shoulder in the path of travel of the lever.

ORE PULVERIZER AND CONCENTRATOR.—No. 850,952; Obadiah K. McCutcheon, Pittsburgh, Pennsylvania.



In a pulverizer and concentrator, a suitable receptacle designed to receive water and ore, a cylinder journaled longitudinally of the receptacle, means for rotating the cylinder; the said cylinder having a series of diagonally-disposed openings therethrough, bolts in said openings having flattened heads extending longitudinally thereof and provided with apertures, means for securing the bolts in place, beaters applied to the bolt-heads, said beaters consisting of blades having bifurcated inner ends to receive the heads of the bolts, and having transversely-disposed apertures adapted to register with the apertures of the bolts, and securing means engaging the bolts and beaters.

MECHANICAL DRIER.—No. 857,161; William M. Cummer, Cleveland, Ohio.

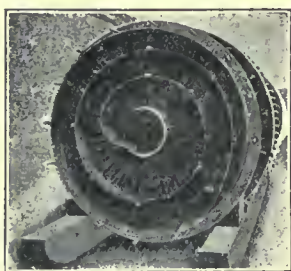


As a new article of manufacture, a drying cylinder formed in sections, and rings connecting the sections provided with openings transversely through the middle thereof, whereby draft passages are formed into the cylinder.

Spiral Feed for Tube-Mills.

The Editor :

Sir—Referring to your issue of April 27, on page 541, we notice an article entitled 'Feeder for Tube-Mill.' As you are probably aware, we have been developing and perfecting the spiral feed and discharge for the past five years and have had its application to tube-mills patented in a variety of styles in the United States and foreign countries. Among our patents is one on which the feed shown in your paper is without doubt an infringement, although we harbor no ill feeling against the parties describing or using it. The writers of the article mentioned we believe are, or were, connected with a company to whom the advantage of our feed was fully explained several years ago, but who did not favor us with their order, as they were rather skeptical regarding our claims. Now, although we are no doubt in a position to bring action against these people for infringing our patents, we think that in view of the fact of their endorsing our feed so highly, we shall not do so, as their expenses for wear and tear on the mill as furnished them



originally were no doubt very high and then they had in addition to pay the cost of rebuilding the machine. In justice to ourselves, however, we think it no more than right that you give this letter the same prominence that the previous article had.

We forward herewith an illustration of our Ideal spiral feed, showing that we formerly made it of wrought-iron plate, protected by cast-iron heads. Our latest construction is to make it entirely of cast iron.

The inventing of this spiral feed was the means of perfecting the tube-mill. Heretofore, there was no feed on the market that did not require both a separate driving arrangement and stuffing-boxes to stop it from leaking, whose main working part was a conveyor, which frequently wore out, got clogged up or broke, causing long and serious delays.

The foregoing troubles have been overcome by the simple arrangement described, which does away with a special drive, being attached direct to the mill, with which it revolves. The saving in labor will be readily appreciated when it is considered that a 4 ft. 6 in. by 20 ft. tube-mill has a charge of eight tons of pebbles and a 5 by 22 ft. mill a charge of 10 tons.

There are several more important advantages gained by the use of our Ideal spiral feed and discharge, which apply to trunnion as well as tire machines. First: It allows the loading of pebbles from 5 to 8 in. over the centre, which is not possible with machines that are equipped with other feeds, as the pebbles would clog them up or break them entirely, thus giving our mills an increased grinding capacity. Second: The pebbles in all tube-mills, when in operation, are carried up on the side toward which the machine revolves, so that a certain quantity of those on the bottom, on one side of a line drawn from the centre of a mill, are balanced by those on the other side of this line, and the weight to be lifted is thereby greatly reduced. In our tube-mills, where the charge of pebbles extends over the centre, the balanced portion is proportionately increased, thus greatly decreasing the power required to operate them.

When reducing material wet, another advantage, in addition to those above stated, is gained. With our feed these mills can be pumped from two-thirds to three-fourths full of material, by attaching a valve at the discharge end to regulate the outflowing stream, by which the grinding capacity is nearly doubled and at the same time the power

is reduced about 40%, so that a 5 by 22 ft. mill (tire style) can be operated with the use of about 40 horse-power.

You will readily appreciate that the engineers who designed the feed for the tube-mill, mentioned in the first part of this letter, unwittingly paid us a high compliment by so closely imitating our design.

ABBÉ ENGINEERING CO.,

Paul O. Abbé, Secretary.

New York, June 20.

Ejectors as Liquid Elevators.

There is a little machine known as an ejector, whose large field of usefulness is not yet appreciated by a great many users of steam. It is marvelously simple in construction, requires but a small amount of steam—far less than a steam pump—and on account of its compactness and portability, allowing it to be placed with little expense near the work to be done, is becoming a common substitute for steam pumps, syphons, etc. It would be difficult to enumerate all the uses to which an ejector is adapted, but when we say that anything and everything in the nature of a liquid (if not too thick) can be transported from one level to another, or horizontally any reasonable distance, the ground is just about covered.

Complete information as to the XL-96 ejector and its uses may be obtained by writing to the manufacturers, Penberthy Injector Co., at Detroit, Michigan.

Commercial Paragraphs.

THE WIRT ELECTRIC CO., of Philadelphia, has been absorbed by the Cutter-Hammer Mfg. Co., of Milwaukee, Wisconsin.

THE ALLIS-CHALMERS CO.'s office at Seattle, which is in the charge of G. W. Pulver, the district manager, has been moved to No. 115 Jackson street.

THE KROGH MANUFACTURING CO. is again back in the same site as before the earthquake and fire. The new address is 149 to 163 Beale St., San Francisco.

THE NATIONAL WOOD PIPE CO. announces that owing to the unprecedented growth of its business and the establishment of the general offices of this company at Los Angeles, necessitating additional space for its officials, engineering corps, and clerical staff, it has secured the commodious rooms 403 to 409 Equitable Savings Bank Bldg., on First and Spring St., and now occupies these new offices.

Trade Treatises.

THE LUNKENHEIMER CO., of Cincinnati, Ohio, has issued a booklet called 'Generator Valves,' for use as check-valves on two-cycle engines.

THE D'OLIER ENGINEERING CO., of Philadelphia, is sending out a new Bulletin—Series T, No. 8, on 'Centrifugal and Turbine Pumps.'

ROCKWELL ENGINEERING CO., of New York, sends an illustrated description of their rod-heating furnace and of a similar furnace for heating bolts.

THE NEW YORK FLEXIBLE METALLIC HOSE & TUBING CO., of New York City, has issued Bulletin No. 25, on Hyflexmet lead-covered flexible metallic hose and tubing.

AMERICAN SPIRAL PIPE WORKS issues an excerpt from their catalogue of forged steel pipe flanges. This catalogue is a most complete work and ought to be valuable to engineers.

THE UTAH MINING MACHINERY AND SUPPLY CO., of Salt Lake, mails us Bulletin No. 400, describing the Callow settling and pulp-thickening tank, and the Callow system of ore classification.

THE AMERICAN SPIRAL PIPE WORKS, of Chicago, Ill., sends us an attractive 100-page catalogue of 'Forged and Rolled Steel Pipe Flanges,' including special forgings, and full-sized cross-sections of flanges used in the different standards.

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TABLE OF CONTENTS

Editorial:	Page.
Notes.....	63
Ore Deposition.....	64
Electrical Smelting of Iron Ore.....	65
General Mining News.....	67
Special Correspondence.....	72
Butte, Montana.....	
Mexico City.....	
Pioche, Nevada.....	
Salt Lake, Utah.....	
Toronto, Canada.....	
Cripple Creek, Colorado.....	
Concentrates.....	77
Discussion:	
Conveying Tailings Through Pipe...C. W. Van Law	78
Cyanidation in the Transvaal.....	
.....Another Correspondent	78
A Fundamental Problem.....George H. Collins	79
Articles:	
Some Ore Deposits in the Inyo Range, California...John A. Reid	80
Concluding Notes on Guanajuato...T. A. Rickard	83
A New California Map.....	84
The Dome of Equilibrium and the Caving System of Mining.....Claude T. Rice	85
The Electrical Smelting of Iron Ore...R. L. Phelps	87
Alaska Coal Fields.....	89
Notes on Smoke Suits...An Occasional Contributor	90
Notes on the Fundleion Smelter.....	91
Rare Mercury Ores.....Clifford G. Dennis	92
Centrifugal Pumps.....	94
Mining and Metallurgical Patents.....	93
The Prospector.....	86
Departments:	
Personal.....	66
Market Reports.....	66
Obituary.....	66
Trade Treatises.....	94
Books Received.....	94
Commercial Paragraphs.....	94

Editorial.

ACCORDING TO a special report issued by the statistician of the Census, it appears that California, with a population of less than 1,500,000, has a total wealth of \$4,200,000,000. To give meaning to these figures it may be stated that France, with a population of 38,000,000, has a total wealth about ten times as much, and Germany, with 52,000,000, is only nine times as rich. The wealth per capita is \$1,125 in the United States as a whole, \$1,155 in Great Britain, \$1,228 in France, \$751 in Germany, \$1,247 in Australia, and \$2,800 in California.

IT IS LIKELY that the 'Notes on Smoke Suits' will interest those concerned with smelting. The writer of that article is, as his observations indicate, an experienced metallurgist, with a wide knowledge of smoke litigation. The subject is vital to the progress of the mining industry, and it is well that it should be discussed frankly, to the end that smelting operations may not be hindered by ignorance on the one hand or carelessness on the other.

ACCURATE DESCRIPTIONS of local geology are apt to be useful to mining engineers. The article by Mr. John A. Reid is a conscientious and clear statement of the conditions under which lead and silver ores are found in the Inyo range, which lies just east of the Sierra Nevada. Mr. Reid's sketches help his description, and the article as a whole affords a good example for the younger men to whom opportunities for similar observations must often be presented in the course of their work as mineral scouts.

EVEN the honored name of Abraham Lincoln is used as a lure by peddlers of mining stock. The portrait of the great patriot is employed to adorn the offer of shares at five cents made by a "financial agent" at Chicago. To put the name of Lincoln on the lure of a promoter indicates a callous effrontery only too characteristic of the vendor of wild-cats. It is to be hoped that the impertinence will warn those who might not otherwise appreciate the misleading nature of the statements made concerning the mine.

PEDDLERS OF STOCKS occasionally make the mistake of sending us their flamboyant circulars. Thus the Knickerbocker Syndicate of New York offers us the chance to buy a stock that is to pay 100 per cent, it being explained that dividends of 100% "are not uncommon in the case of concerns controlling great natural resources." We have no reason to believe that the marble quarries of the Colorado-Yule Marble Company are among the great natural resources that will serve as the basis for such marvelous finance, but we do

think it high time for C. F. Brackett, professor in Princeton University, to consider whether it is seemly for him to be a director of this company. The promoters of it have been inundating the country with their pestilential letters and circulars for more than a year.

WE PUBLISH a letter from Pioche, Nevada, one of the old mining camps that has been revived by the warm air of speculative activity. Pioche was a great district in years that are past and it ought to gain largely by the better facilities to be provided by railroad communication, improved metallurgical methods, and more businesslike ways of operation—that is, provided there is the ore required for the application of these factors. We understand that there is a good deal of low-grade ore in the old mines; this will be determined by unwatering the workings.

Ore Deposition.

IT WAS A SUGGESTIVE IDEA that Mr. Horace V. Winchell offered in our last issue concerning the ratio of oxidation to erosion. He pointed out that secondary enrichments of ore are rare in Alaska, Siberia, and other cold climates while they are frequent in the deserts of Nevada and Australia, or on the sunny slopes of mountains in Colorado and California. It is suggested by him that the higher temperature accelerates oxidation, facilitates solution, and sets in motion the chemical reactions that cause the formation of bonanzas underneath the gossan. In Nevada oxidation keeps ahead of erosion; in Alaska oxidation is slow while erosion is apt to be rapid, more especially within the range of glacial action. Secondary enrichments of copper ore have been found in Alaska at the surface, with the poor primary ore a few feet underneath, as if erosion had removed the overlying portion of the lode at the expense of which the rich ore had been formed, so that instead of an iron hat the lode wears a copper crown, likely to prove misleading to an optimistic novice. We may add that in the hot desert regions of Queensland and Arizona, for example, it is not unusual to find oxidation reaching to 400 or 500 feet below the present surface, indicating the slowness of erosion and the penetrative power of the descending oxidizing waters. Under such conditions silver veins are robbed at their outcrop with re-deposition of the chloride, while gold lodes undergo a chemical and physical concentration resulting in superficial bonanzas of extraordinary richness.

In another contribution on this subject, appearing in the Transactions of the American Institute of Mining Engineers, Mr. George J. Bancroft has offered a scholarly discussion on the enrichment of veins. Many of the conclusions reached by him are re-statements of the views of earlier writers, but they are made from a different standpoint, and in addition to these he offers several new suggestions likely to provoke thought and observation. We are glad to note his references to the ground-water. Geologists have gone astray in assuming a water-saturated zone extending several miles underground, but

mining operations have demonstrated that the rocks become dry in depth, indeed, most deep shafts in the country rock become dusty, because the evaporation is more rapid than the capillary movement of the moisture. Mr. Bancroft writes clearly on this matter, and emphasizes the fact that "the torpidity of the ground-water in depth is caused by the tightness of the rocks." He argues that the position of the zone of flowage, that is, the horizon at which rock deformation is caused by pressure, is not fixed, so that a channel for solutions may exist for a short time below the limit usually estimated, and serve as a passage for ore-forming agencies. In mine workings the ground will swell, and the excavation tends to become closed, but this tendency is a function of time. Next, he offers evidence in support of the view that orebodies are formed quickly by strong solutions. He asks no blank check on the bank of Time. The fact that few, if any, mineral springs have been detected "in the act" of making ore deposits leads him to assert that a relatively short period of time is involved, for otherwise we should be able to see the process in action somewhere. Thus he comes to the theory that the solutions forming orebodies have had rich sources, and that there is a barysphere containing large amounts of the useful metals. All of which is interesting and to the point.

It is likely enough that the weak solution acting for an indefinite period has been given too much credit and that we have avoided the heart of the problem by big generalizations of a perfectly safe kind leading nowhere in particular. But as regards ore deposition "in the act," we have it in Butte where zinc sulphate is deposited on the timbers and copper sulphate is reduced by the iron rails; we have it in the wood that has been silicified and enriched with gold in the alluvial diggings at Ballarat; and we have it in the pick handle that caused galena to be precipitated in a New Mexican mine. In a recent letter from Mr. E. R. Pembroke we are informed of another good example: At Bingham a shaft was sunk by Col. Wall near the entrance to the Yampa mine; the shaft was 40 feet from the creek and also 40 feet deep. At the bottom, which was 7 feet below the bed of the creek, the ground was a loose mass of angular debris. Many of the fragments were coated with metallic copper and cuprite, due to the reduction of copper sulphate by organic matter in the drift. Such instances do not controvert Mr. Bancroft's claim that no mineral springs have been caught in the act of making ore, but it is not necessary that mineral solutions should be emitted in the form of springs; on the contrary, it is our opinion that in most cases the ascending waters lose themselves when they strike the zone of ground-water and that ore formation rarely occurs at the immediate surface. It is erosion that uncovers the seat of action and causes the ore itself to appear as an outcrop.

That ore formation does not need indefinite time is suggested by the comparative youth, geologically, of most orebodies. The number of post-Cretaceous occurrences of ore vastly exceeds those of earlier periods and even in cases such as the Homestake lode, which existed

in pre-Cambrian time, it is likely that enrichment is largely due to later thermal activity associated with the eruptive that breaks through the Cretaceous and therefore is of Tertiary age. The number of veins of ore existing at 100 feet is vastly greater than the number of those existing at 2,000 feet; there is a decrease in the fissuring and there is a still more marked diminution in the richness of the ore occurring in the fissures or associated with them. This indicates a connection with the surface and as the surface is geologically a thing of yesterday, there is the suggestion that the orebodies were not formed at a greatly remote period but are to be credited to agencies that are at work on the outer rim of the earth, although derived from the deep at such times as readjustment of the exterior caused a temporary and local communication with the region underneath.

Electrical Smelting of Iron Ore.

IN THIS JOURNAL under date of November 17, 1906, there appeared an article by Mr. Donald F. Campbell on the iron deposits lying on a ridge dividing the Pitt and McCloud rivers in Shasta county, California, and mention was also made of an experiment on a working scale to be made with the electrical smelting of this ore by the Héroult process. On another page an account of this experiment is given by Mr. R. L. Phelps. A few additional facts, gathered during a brief visit to the locality, may be offered here.

The deposit of iron ore consists of a large body of magnetite, uniform in texture and analysis, containing from 68 to 70 per cent iron, that is, only $2\frac{1}{2}$ to 4 per cent of impurity. Although as yet only partially explored, there is evidence to warrant the expectation of a plentiful supply of ore and it is so situated as to be conveniently transported to the smelter. The magnetite appears to be associated with diorite and it lies at the contact with a limestone so pure as to serve as a flux in smelting. The iron mine and the limestone quarry are alongside. The ore probably originated from a mixture of pyrrhotite and marcasite; it is almost free from sulphur and no sulphides are visible in the ore except in spots along the contact where traces of pyrite can be detected. In brief, the material is particularly well adapted for the purpose in view. It is expected that the ore can be delivered for \$1.50 per ton to the smelter.

Next comes the question of electricity. This is obtained from one of the transmission lines of the Northern California Power Company, whose generating stations are situated in the Sierra Nevada, about thirty miles away. The cost of electric energy is \$12 per horse-power per annum, a figure that leaves a reasonable profit to the power company. The application of electrical smelting to the reduction of this magnetite was the idea of Mr. H. H. Noble, the president of the power company mentioned, and the cost of it is being defrayed by him personally. He had heard of the experiments made at the Sault Ste. Marie under the auspices of the Canadian government and entered into communication with Dr. Paul Héroult, the inventor of the electrical furnace.

It will be remembered that at the Sault the Sudbury ore was converted into nickel-steel at the works of the Lake Superior Corporation, but the result was a failure from a commercial standpoint because the product brought only \$35 per ton as against the \$65 that was expected. The nickel trust (the International Nickel Company) controlled the market too effectively, so the Canadian government abandoned the experiment. It was on a small scale, and largely inconclusive, although encouraging. Then experiments were made at Portland, during the time of the Exposition. These were misleading and badly conducted. In the meanwhile the making of steel from iron in the electrical furnace had become an established process and the success of this method was often confused with the much more important and basic process of smelting the ore itself. Moreover the earlier experiments had involved the use of a single-phase current and here in Shasta county the current available is of the three-phase type. It was feared that the three electrodes in the furnace would short-circuit so that the current would not pass through the neutral pole, that is, the bottom of the furnace, which is made of a carbon paste, tamped tight, and of the same material as the electrodes themselves. Such fears have proved groundless, for the furnace works most satisfactorily in this regard; the perfectly even tone of the humming noise made by the operation suggests the steadiness of the current, as is confirmed by the ammeter. For a description of the furnace the reader is referred to the article by Mr. Phelps. Several interruptions were caused, one being due to a pump, another to clogging of a charging tube, and just as this was being corrected the power line was broken by careless blasting on the right-of-way of a new branch railroad now under construction from Pitt to Bully Hill. This shut off the current and stopped the smelting, at the moment when the iron was about to be tapped. Some of it was actually obtained and of good quality. As soon as repairs to the wires are completed, smelting will be resumed by turning on the current and melting the frozen charge just as it is. A 'freeze-up' does not matter in an electrical furnace.

We hope shortly to be able to give further information. The experiment is being conducted in the presence of Dr. Héroult himself and several other metallurgists of established reputation. It means much to California, for the best pig iron sells in San Francisco at from \$30 to \$32 per ton. At Pittsburg it is worth \$20 to \$23. That used in this State comes by sea from Europe, mainly as ballast, and pays a heavy duty. Hence the high price. No iron is made in California, mainly because a suitable cheap fuel is lacking. It is estimated that the magnetite in Shasta county can be converted into pig iron and placed in San Francisco for \$15 to \$18 per ton. If this expectation is fulfilled the industrial development of the Pacific Coast will receive a great stimulus and Mr. H. H. Noble will deserve to be hailed as a pioneer and benefactor.

As we go to press we learn by telephone from the smelter (280 miles from this city) that five tons of iron have been tapped, that the quality of it is excellent, and that successful results are confidently anticipated.

Personal.

J. R. FINLAY is at Joplin.

CURTIS H. LINDLEY is at Salt Lake.

H. C. HOOVER is expected at London.

P. B. WAUGH has returned to London from Bolivia.

WILLIAM BRADEN has arrived at New York from Chile.

J. H. CURLE sailed from New York to London on July 16.

O. B. PERRY is in the Cariboo district, British Columbia.

RICHARD A. PARKER has been examining mines in Nevada.

LEWIS T. WRIGHT is on his way back from London to San Francisco.

AUGUSTINE LAWRENCE has gone from San Francisco to El Oro, Mexico.

D. M. RIORDAN is at the Bully Hill mine, in Shasta county, California.

H. P. GARTHWAITE has returned to the Butters Salvador mines, in Salvador.

WILLIAM FORSTNER is examining copper deposits in Inyo county, California.

G. E. ALEXANDER, formerly at Denver, is in charge of mines at Sparta, Oregon.

T. RUST has returned to San Francisco from the Cœur d'Alene district of Idaho.

E. J. BAYLISS and C. V. HAINES have opened an office at 683 Salisbury House, London.

RICHARD M. ATWATER, JR., has returned from an extended professional trip in South America.

FRANK DOREMUS, of Santa Barbara, is with the Mammoth Copper Co., at Kennett, in California.

NOEL BARBER, recently with the Combination Mines Co. at Goldfield, has gone to El Oro, Mexico.

W. C. HAMMATT, constructing engineer, has finished his work for the Mammoth Copper Co. and is now in this City.

THOS. A. VARDEN has been at Kennett, in Shasta county, Cal., this week, making an examination of the Uncle Sam mine.

JOHN E. ROTHWELL is at Indé, in Durango, where he is building a cyanide plant furnished by the Colorado Iron Works.

LLOYD WOMBLE, of the Witwatersrand Deep mine, has reached San Francisco from South Africa on a six months furlough.

D. A. LYONS, professor of metallurgy in Stanford University, is visiting the mines and smelters of Shasta county, California.

W. E. SIMPSON, formerly at Kalgoorlie, has become consulting engineer to the Einasleigh copper mines, in Queensland.

JAMES MACNAUGHTON, general manager of the Calumet & Hecla mine, has received an honorary degree from the University of Michigan.

HUGH ROSE, assistant general superintendent of mines for the American Smelters Securities Corporation, is at Santa Barbara, in Chihuahua, Mexico.

HENRY S. WASHINGTON and J. VOLNEY LEWIS have formed a partnership as consulting geologists and mineralogists, with an office at 95 Liberty St., New York.

W. G. MOSHER was in San Francisco last week on his way to Kansas City. He has been associated with Chas. Butters & Co. at the Prietas and Divisadero mines.

Obituary.

Latest Market Reports.

LOCAL METAL PRICES—July 18.

Antimony.....	17.00@20.00c	Quicksilver (flask).....	888@89.50
Copper.....	21.00@25.00c	Spelter.....	7.75@ 8.50c
Pig Lead.....	5.35@ 6.30c	Tin.....	43.25@44.75c

ANGLO-AMERICAN SHARES.

Cabled from London.

	July 11.	July 18.
	£ s. d.	£ s. d.
Camp Bird.....	1 1 9	1 0 7½
El Oro.....	1 8 9	1 8 9
Esperanza.....	2 1 6	2 7 0
Dolores.....	1 5 0	1 6 3
Oroville Dredging.....	0 16 9	0 17 0
Stratton's Independence.....	0 3 0	0 2 10
Tomboy.....	1 11 3	1 11 3

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.

Date	Electrolytic Copper	Lead	Spelter	Silver
July 12.....	21½	5¼	6.18	67¼
" 13.....	21¾	5¼	6.18	67¾
" 14.....	Sunday. No market.			
" 15.....	21¼	5¼	6.18	67¾
" 16.....	21	5¼	6.05	67¾
" 17.....	21	5¼	6.05	68¾
" 18.....	21	5¼	6.05	68¾

MINING STOCK QUOTATIONS—NEW YORK.

	July 3.	Closing Prices July 18.
Bingham Central.....	1¾	1¾
Boston Copper.....	28¾	26¾
Cumberland Ely.....	8¾	9
Dolores.....	6½	6½
El Rayo.....	5¾	4¾
Guanajuato Con.....	3¼	3¾
Glroux Con.....	8	8
Greene Con.....	21	25
Nevada Con.....	14¾	14¾
Nipissing.....	107½	10¼
Tennessee Copper.....	38¾	19¼
Tonopah Ex.....	1¾	1¾
Tonopah-Belmont.....	3¾	3¾
Tonopah.....	13¾	11¾
United Copper.....	64	61½
Utah Copper.....	26½	29

(By courtesy of Hayden Stone & Co., 25 Broad St., New York.)

SOUTHERN NEVADA STOCKS.

San Francisco, July 18.

Atlanta.....	\$ 61	Laguna.....	1.50
Belmont.....	3.45	Little Tonopah.....	2.50
Columbia Mtn.....	61	Manhattan Con.....	49
Combination Fraction.....	2.60	Midway.....	1.12½
Daisy.....	2.15	Mizpah Extension.....	25
Fairview Eagle.....		Mohawk.....	17.00
Florence.....	5.45	Montana Tonopah.....	3.30
Gold Bar (Bullfrog).....	68	Nevada Hills.....	6.00
Gold Bar (Goldfield).....		Red Top.....	4.25
Goldfield Con.....	8.40	Sandstorm.....	45
Goldfield of Nevada.....	1.60	Silver Pick.....	60
Gold Kewanas.....	79	St. Ives.....	94
Great Bend.....	73	Tonopah Extension.....	1.65
Jim Butler.....	1.05	Tonopah of Nevada.....	12.50
Jumbo.....	4.25	Tramp Con.....	48
Jumbo Extension.....	1.77½	West End.....	85

(By courtesy of W. C. Ralston, 368 Bush St.)

COPPER SHARES—BOSTON.

Name of company.	July 18.	Name of company.	July 18.
Adventure.....		Michigan.....	14½
Ahmeek.....	75	Mohawk.....	80½
Allonez.....	45	Nevada Con.....	14
Amalgamated.....		North Butte.....	82
Arcadian.....	6¾	Old Dominion.....	45¾
Atlantic.....	12½	Osceola.....	127
Balaklna.....	9½	Parrot.....	19
Bingham Con.....	15	Phoenix.....	
Boston Con.....	26½	Quincy.....	116
Butte Coalition.....	25	Raven.....	
Calumet & Arizona.....	163¼	Rhode Island.....	5¼
Calumet & Hecla.....	800	Santa Fe.....	3¼
Centennial.....	20½	Shannon.....	17¾
Con. Mercur.....		Superior & Pittsburg.....	16½
Copper Range.....	79½	Tamarack.....	105
Daly-West.....	15½	Trinity.....	22½
Franklin.....	14	United Copper com.....	64
Granby.....	120	Utah Copper.....	46¾
Greene-Cananea, ctf.....	16	Victoria.....	7
Isle Royal.....	19	Winona.....	8
Mass.....	5½	Wolverine.....	160

(By courtesy of E. F. Hutton & Co., 490 California St.)

from the 1,800-ft. level of the Maryland. The property adjoins the Norambagua, that is being worked by the Pittsburg Standard M. Co. The directors of the Belle Union are Ed Dunkley, James Gluyas, C. M. Peek, W. P. Shaw, George Price, and Frank Russell.—The pumps have been started at the Banner mine. It will take six weeks to unwater the workings, which are full to the level of the drainage tunnel. When the mine is dry, the 900-ft. level will be run under the ore-shoot encountered in the old shaft.—Since bonding the Mountain View mine, on Canyon creek, E. B. Miller has installed a small mill and built 4,000 ft. of flume and laid 700 ft. of pipe. The mine is looking well.—Drifts are being run under the main channel at the Cold Spring mine, on Washington ridge, near the old Harmony. Good gravel was tapped recently, and as soon as enough ground was opened to allow of steady breasting the mill will be started. Thomas Coan is the foreman.—A new blacksmith-shop, dry-house, and office are being built at the Norambagua, and the main tunnel has been retimbered. The company is awaiting the arrival of steel rails for the tunnel.—The pay-shoot in the Champion and Home mines has been struck in a drift on the 800 level in the Home, which leads both these companies to believe that the shoot is going to hold with depth. In the Champion, a drift is

being run south on the 800 level, and this will connect with the bottom of the Home shaft. At the Champion mill 20 stamps are dropping, and 30 at the Home mill. James Moore is the foreman.—John J. Habeecker and C. G. Michener of Philadelphia have made an inspection of the Giant Hinz mine, in which they are interested.—The new electric hoisting and pumping plant at the Ethel, 1,400 ft. from the tunnel portal, has been completed. A winze will be sunk on the vein at the face of the tunnel.

PLACER COUNTY.

The Santa Fe gravel mining company will soon start work on its property.—The shaft is down 40 ft. on the Dewey mine, which is being worked by Ned Gilbert.—At the Black Hawk mine on the North Fork, 14 men are employed and the tunnel is in 400 ft.—A clean-up of 73 oz. of amalgam was recently made by the lessees of the Stemples tailing mine.—All of the plant is in place at the Hathaway. Power will be brought from Newcastle. The power-line will be 3,000 ft. long. The motor is rated at 180 h.p., and the 20-stamp mill is modern in every detail. The lowest tunnel taps the vein at a depth of 600 ft. and the vein has been worked in places to the 720-ft. level. This mine lies between the Kirkwood on the east and the Eureka on the west. These mines will all be connected by drifts. They are owned by the Ophir Valley M. Co., composed of New York capitalists. A. B. Eastwood is the manager.

SHASTA COUNTY.

The Du Boise gold dredge that has been operating on the sands of the Sacramento river at Middle creek, is a suction dredge. Patents controlling this process have recently been allowed. The method heretofore has been carefully guarded. The sand and gravel in this vicinity are held in large crevices formed by the rock ridges crossing the bed of the river. These ridges form natural riffles from which the sand is lifted by the dredge to the treatment plates and riffles.

SIERRA COUNTY.

(Special Correspondence).—At the Sierra Buttes mine, near Sierra City, 60 stamps are running steadily and 112 men are employed. The mine is owned by the Hayes Brothers of San Jose and is superintended by J. E. Olsen.—At the Hayes Consolidated, which is owned principally by Jack and Phil Hayes, of Sierra City, the 20-stamp mill is nearing completion and will be in operation within three months. The mill will be run by water-power, the ore being transported from the mine to the mill 2,500 ft. distant, by means of an aerial tramway. Jack Hayes is the superintendent.—In Ladies canyon, the Sovereign Mines Co. is installing a sawmill to get out the necessary lumber with which to erect a 10-stamp mill, cyanide plant, office buildings, boarding house, etc. An air-compressor and machine-drills will be installed soon. About 35 men are employed and a road from Sierra City to the mine has been completed; the power ditch is ready to have the water turned in. Horace Morse is the superintendent.—The mill at the Keystone will be reconstructed before fall; it was taken away by a snowslide during the winter storms. Fred Perryman is the superintendent.—At the Alice mine in Jim Crow canyon, near Downieville, the five-stamp mill that was erected this spring is running steadily on ore that plates from \$5 to \$6 per ton. The company will install five additional stamps, concentrators, and a rock-breaker some time this summer. George McGee is managing the property.—It is expected that the Comet mine will have some development work done on it during the year.—Mr. Gilbert, of New York, has commenced cleaning out the tunnel at the Black Jack mine, situated in Jim Crow canyon. This property was operated successfully during the early eighties. A snow-slide took this mill away, and no work has been done since. The ore milled \$15 in free gold, besides carrying sulphides which were not saved at the time. At the Buckingham property, in Jim Crow canyon, the five-stamp mill is being run on high-grade ore. This vein is on the granite and slate contact that runs through this district from Nevada county.—At the West Point mine, situated at Monte Cristo, the tunnel is being driven ahead to intersect the White Bear channel, which was worked by

Wm. Belcher south to the intersection of the West Point ground. This channel was rich. The West Point company has three-quarters of a mile of this channel on its ground. John Peckwith has charge of the work at the mine.—The Excelsior company is driving the White Bear tunnel to intersect this channel. The rock is hard, making the progress slow. The Excelsior is owned principally by John Costa. John Schofield is superintending the work.—A. G. Hunter was awarded the contract to continue the main working tunnel 200 ft. at the Herkimer mine, at which point they expect to intersect the Bunker Hill channel.

Downieville, July 10.

The new wagon-road to the Sovereign mine is finished and the sawmill will soon be running, cutting lumber for the new mill.—The Sierra Buttes mine, at Sierra City, is operating full handed, and both the 60 and 20-stamp mills are running. About 125 men are employed and timber contracts have been awarded by the company, for 600,000 ft. of lagging and 100,000 ft. of poles.—Two shifts are working in the Empire mine, in Gold valley, 13 miles from Downieville. The 20-stamp mill is running. Operations were suspended six months ago, when the electric plant burned out.

SISKIYOU COUNTY.

John Garvey has sold his interest in the Garvey Bar river claim to the La Shells. This claim is on the Klamath river above the mouth of Humbug creek, and the bedrock gravel has been proved to be rich.—The directors of the Patterson Creek or Sheba quartz mine have levied an assessment of 10c. per share. Noel E. Groves is the superintendent.—The dredge at the Doggett mine on Klamath river has temporarily suspended operations on account of a break-down.—The Mono company is employing 30 men and is running two 2-stamp batteries.—The McKinley mine, with a five-stamp mill, will be operated again, by Eastern capital.—The Spencer mine has been bonded to Portland parties. The waste dump will be worked over again.—The Eliza company, composed of Portland people, and equipped with a 10-stamp mill, is considering the installation of a cyaniding and concentrating department.—The Heglen mine, which has a vein two feet wide, and is equipped with a five-stamp mill, is being examined by engineers.—The Boyd group, equipped with a Huntington mill and a four-stamp battery, has been bonded.—It is reported that the McKean mine, near Callahan, in southern Siskiyou county, is being operated with good results. It is owned by the Helena Gold Mining Co., for which A. Sydney Addison is manager. The new shaft will be sunk 250 ft. below the old workings.

TRINITY COUNTY.

The La Grange mine, the largest hydraulic mine in the world, has been recently acquired by the Bully Hill Copper Mining Co. of Shasta county. It is understood that the controlling interest in this mine is held by the General Electric people. The same group of capitalists are behind the Sacramento Valley & Eastern railroad, which is a broad-gauge road under construction to tap the mining and agricultural districts of the counties lying in the north-eastern part of California. This railroad forms a junction with the Southern Pacific railway at Pitt, in Shasta county, about 275 miles from San Francisco.

COLORADO.

TELLER COUNTY.

A big cave-in is reported at the No. 2 shaft of the Stratton Independence, on Battle Mtn. The roadbed of the Midland Terminal railway has sunk for a length of 400 ft. and the water-main supplying Victor has burst. The caved area covers about four acres.

IDAHO.

IDAHO COUNTY.

Two hundred thousand dollars is the price reported paid by F. W. Bradley for the Buster mine at Elk City, south of Spokane, owned by S. W. Smith. The Buster is a gold proposition and considerable development work has been done by Mr. Smith. The orebody has increased with depth until now it is 400 ft., with improvement east and west in

the lower drifts. Joseph Thorn is superintendent and the company will erect a 10-stamp mill and a cyanide plant, the former being equipped with 1,200-lb. stamps, and will be enlarged as the work progresses. Ground has been cleared for a power-house and head-frame.

Four feet of ore in a vein has been opened at a depth of 100 ft. in the Keno group, on Sheep Mtn., in the Rapid River district, in central Idaho. The property is owned by Charles Jansen and John Wilson. The strike was made at the face of the 175-ft. cross-cut tunnel. Assays gave returns of \$14.63 in silver and \$9.92 in gold.—A 14-ft. vein of gold-bearing ore has been cut on the 500-ft. level of the Gold Coin mine in the Seven Devils district. It is free milling. The Gold Coin, which is owned principally by residents of La Crosse, Wis., is equipped with a stamp-mill, which has been shut more than two years, while the long lower tunnel was being run.

ROOTENAI COUNTY.

While doing assessment work on the Graphite claims, east of Priest lake, Andres Coolin, principal owner, uncovered a vein carrying molybdenum. The metal is found in a dike of diorite which cuts through the granite, and can be traced for 700 ft. up the hill. The dike of diorite is fully 700 ft. wide, and the seams contain the ore.

Official announcement is made in Spokane that the Panhandle Development Co., the Panhandle Smelting Co., and the Ponderay Transportation Co. have been merged, the smelting concern, incorporated for \$5,000,000, being the parent organization. The development company, capital stock \$300,000, owned the townsite of Ponderay, including water fronts and water-power sites. The Ponderay townsite surrounds the smelter a mile and a half from Sandpoint. The transportation company, capital \$300,000, owned boats on Lake Pend d'Oreille, ore-barges and pile-drivers. None of the stock of these companies has been issued. They were organized as subsidiary companies. T. L. Lammers, manager for the smelter company, of which J. Herbert Anderson, of Chicago, is president, announces the capacity of the plant will be 100 tons per day when it begins operations. Two thousand tons are at the smelter and ore is being brought from Montana, the Coeur d'Alene, and the Pend d'Oreille Lake district, coke being shipped from Connellsville, Pennsylvania.

LEMI COUNTY.

Lemhi county, east of Spokane, promises to become one of the rich silver-lead districts of the Northwest. The district has been shipping ore for years, but little is known of it. W. H. Jackson, engineer for the Federal Mining Co., recently visited the district, and pronounces it one of the best he has yet inspected. He believes that the Gilmore and Kaufman camps will prove to be rich. There are mines there that have produced as much as \$10,000,000. The Gilmore mine near the town of Gilmore last year produced more than \$200,000 above expenses of development work, and the product of the Gilmore has to be hauled about 80 miles overland to the nearest railroad. The ore is a lead carbonate, with no sulphides to speak of, and carrying an excess of iron. The smelters pay \$3 per ton more than for the average lead-silver ore. The district is an extensive one, but suffers from lack of transportation.

SHOSHONE COUNTY.

Ore cut at a depth of 350 ft. on the Lucky Friday vein recently proved richer in silver than any strike yet reported from the Coeur d'Alene. The tunnel was in 624 ft. when the lode was cut and gives 400 ft. of back. The main vein is 11 ft. wide. Next to the hanging wall, on a talc seam, is 18 in. of gray copper and galena in quartz, which assays \$2.60 gold and 110 oz. silver per ton, and 4.8% copper and 8% lead. Next to this lies a five-inch streak of ore which carries 100 oz. silver, 2.4% copper, and 36% lead. The pay-streak is four feet wide, the rest of it being rich enough to ship after hand sorting. Shipping will begin in 60 days. The Lucky Friday group consists of three claims and a fraction, and is a little way east of Mullan, near the Hunter mine. The principal owners are: George E. Potter, Walter A. Jones, J. E. Wade, M. B. Brownlee, Mrs. James Clark, Nuzum Brothers, Slater Brothers, Charles Lund, J. H.

Wilmot, M. J. Gordon, W. T. Stout, and Edward Erwin.

—Active work on the development of the Reliance mine, an extension of the Black Cloud-California property near Wallace, has been started by the C. E. Mitchell company of Spokane. The property was not developed earlier owing to the fact that the owners lacked capital to push the work and were not willing to incorporate a company for development purposes. Control of the property was acquired by the Mitchell company, which is operating a number of mines in the Coeur d'Alene district. Cabins have been erected and a good wagon-road constructed to the property, the work being done under the direction of Sanford Daigle, superintendent. Work on the tunnel has been started and is being pushed day and night.

NEVADA.

CHURCHILL COUNTY.

(Special Correspondence).—The shaft at the Jackpot is 200 ft. deep, from which point a cross-cut will be driven. A 50-h.p. hoist has been installed at a shaft being sunk above the old one. A carload of ore is being sacked for



Map of Southwestern Nevada.

shipment.—A 4-ft. vein has been struck on the Hercules No. 3 claim of the Winder National Co. The high-grade ore is being sacked.—The Spider-Wasp Co. is working three shifts in the main shaft, which will be put down 300 ft. The Toohy, Watts, and Spider-Wasp Development leases are in ore.—The Nevada Wonder has commenced shipping ore. The shaft is down 125 ft., and will be sunk to the 400-ft. level.—Sinking on the Miami Wonder has been resumed, and a depth of 70 ft. has been reached. Some good quartz is in sight.

Wonder, July 10.

ELKO COUNTY.

(Special Correspondence).—A 10-ft. vein has been encountered in the placer workings operated by the Nevada Hydraulic M. & M. Co., one mile southeast of this camp. Two other veins carrying gold and silver have also been found.—A 14-in. vein carrying gold, with some silver, has been struck in the Coffee Pot shaft on the Independence group at Mountain City.—A strike of copper ore has been made 200 ft. from the face of the main tunnel on the Baltimore group on Lone Mtn. This property has been profitably operated for 12 years. The group is owned by the Pacific Con. Co.—Ore carrying copper, and some gold, has

been uncovered in the Little Marsh mine, near Carlin.—Ole Elliott, of Goldfield, has bonded several quartz and placer claims on Salmon creek, and has men at work developing them.—A 4-ft. vein of ore has been struck in the new shaft on the Jack Pot, at Aura, and a 2-ft. lode in the tunnel runs well.—The Mountain City group, with a record production of \$700,000, has been bonded by J. U. Myer. A 300-ft. shaft will be sunk.—The Protection and Silver Bill companies are working short-handed, because of the scarcity of miners.

Tusearora, July 10

ESMERALDA COUNTY.

(Special Correspondence).—On the Mohawk claim of the Goldfield Consolidated a new vein was recently opened. This new strike was at a depth of 450 ft. in the company's shaft.—The Little Florence lease, on the property of the Florence Mining Co., is making steady shipments. Some of the ore is sacked and shipped, running \$150 per ton.—The Florence Ledge Co. has opened the Florence vein in its workings.—From the Mohawk-Jumbo lease on the Jumbo Extension ore is being shipped.—Among the newer leases the Combination No. 3 lease, on the Consolidated ground, is being developed by a double-compartment shaft that is down 200 ft. Some ore-shoots probably pass through this ground. The Atlanta is in ore, one of the lessees having opened a little bunch of sulphides in his shaft.—The Great Bend and Black Butte have encountered some ore within the past week.—Some leases will be given on the Lou Dillon and Silver Pick Extension claims. These two properties lie in the Mohawk belt, and some think that pay-ore will be found with proper development.

Goldfield, July 13.

(Special Correspondence).—The output of the Goldfield mines for the week ending July 6 was 3,417 tons, valued at \$590,000. Of this amount 1,972 tons were treated at the Nevada-Goldfield Reduction Works, 945 tons shipped to smelters, and the remainder handled at the Combination mills. The ore received at the Nevada-Goldfield plant was from the following properties: Mohawk Combination, 525 tons; Mohawk Jumbo, 275; Little Florence, 225; Sheets-Ish, 350; Red Top, 300; McNaughton, 80; Mohawk, 95; Reitz, 50; and Loftus & Davis, 42 tons of ore. The richest shipment came from the Mohawk, some ore running \$450 per ton.—The total production of Goldfield mines during the month of June was about \$1,142,000.—A 5-ft. vein has been encountered in the 420-ft. level of the Wedge claim on the Jumbo Extension.—Eleven cars of ore, containing 374 tons, recently shipped from the Little Florence, netted the company \$74,800.—It is reported that the Consolidated interests are endeavoring to secure control of the Jumbo Extension.—A good strike has been made in a cross-cut on the 200-ft. level in the Daisy. The vein is two feet wide. The find was made in the Krise lease, in the west end of Daisy No. 1.—Small stringers of ore have been discovered in the main shaft on the Diamondfield Black Butte. The ore was found at a depth of 300 ft.—Good ore is being extracted from the Combination. The highest grade is shipped to the smelters, and the rest is treated at the company's mill. One carload of ore to the Selby smelter, recently shipped, netted \$34,161.—The Walker Lake district, northwest of this city, is attracting attention. Ore has been found on Cottonwood creek, where a new townsite named Lake View has been laid out.

Goldfield, July 12.

LINCOLN COUNTY.

(Special Correspondence).—A find of good ore on the Duplex mine, which takes in the original discovery of ore in this camp is reported.—Good ore has been uncovered on the Spokane claim of the Searchlight Spokane Mining Co., within 10 ft. of the old wagon-road. A shaft has been started at this point.—Four miles southeast of the Spokane and one mile south of the Quartette Mining Co.'s Boston mine, on the property of the Searchlight Comstock Mining Co., another strike has been made. At a depth of 35 ft., a stringer was encountered and the shaft was sunk on an incline of 65°, following the vein. Sinking has been discontinued temporarily pending the installation of a gasoline

hoist that has been ordered.—The Silver Legion is taking out ore in the east drift of the 85-ft. level. The first shipment of 25 tons of ore from these workings will soon be made. Owing to the inflow of water no development will be done on the 185-ft. level until a pump is installed. H. E. Spanogle is the manager.—On the Majestic Goldfrog, some ore was encountered at a depth of 70 ft. and from that point the ore is improving. Bids for a shaft to water-level on the Stanley Forbes Extension are being received by L. J. Kaiser, the manager.

Searchlight, July 12.

NEW MEXICO.

SOCORRO COUNTY.

Good lead and zinc sulphides have been encountered in a tunnel on the Mistletoe group in the Magdalena district, 1,170 ft. from the portal.—George L. Brooks and L. N. Babcock recently transferred a bonded lease on the Lillie, Murice, and Little Flow claims in the Kelly district, to the Empire Zinc Co., represented by C. J. Brown.

WASHINGTON.

OKANOGAN COUNTY.

Ruby, a deserted mining town, near Conconully, west of Spokane, which was a thriving place 15 years ago, is likely to come again into the limelight. J. T. Plant, of Mora, Minn., inspected a property on the mountain side, and found signs of ore. The Washington T. & C. Co. will soon begin work on an 800-ft. tunnel under Mineral hill, near the town of Conconully. The tunnel will explore the ground of 56 mineral claims, and cut eight known veins. It will carry two tracks.—John M. Wentworth, of Loomis, has found what is regarded as a promising gold mine. It is located in the Horse Spring coulee, seven miles east of Loomis. He has an option on the property, and is making arrangements to develop it at once. The gold lies in a limestone formation. A company has been formed by M. D. Thomas, Harvey Thomas, and Newton Thomas, Judge Steiner, of Waterville, and W. D. Wright, of Coeur d'Alene, and is incorporated for \$1,000,000 to develop the Steiner group of six properties, five miles from Okanogan.—The Mountain Sheep mine, near Loomis, will soon join the shipping class. Silver ore recently found is being sacked preparatory to forwarding it to one of the smelters.

STEVENS COUNTY.

Reports from Chewelah, northwest of Spokane, show that a strike of importance has been made on the United Copper Co.'s property, near that place, at a depth of 350 ft., the tunnel being in good copper ore at 600 ft. The vein, which is of white quartz, is from six to eight feet wide. Conrad Wolfe, of Spokane, president of the company, announces that it is planned to carry the cross-cut ahead until the hanging wall is reached, and it is expected to ship within two weeks. The property is equipped with a 1,200-ft. tramway.—At the 180-ft. level of the Jay Gould mine, near Chewelah, 15 ft. of galena ore has been cut, according to F. C. Bailey, superintendent of the property. The lode lies between granite and porphyry walls. Six feet of the vein is rich ore, part of which will bear shipment. The whole Chewelah district is looking up, and important developments are under way. At the Nellie S. mine a six-foot vein of copper ore was recently cut at the 200-ft. level. At the United Copper property a body of copper ore has been opened at a depth of 350 ft. Many other properties are being worked, and the camp is getting away from the hoodoo which has held it for years, for development at depth is proving the value of the orebodies of the district.—Forty thousand dollars, 10% down, is the price of the bond taken by the Dominion Exploration Co. on the Davis & Park group of seven claims in the Metaline district, north of Spokane, the buyer being Frank Brown, who has put a crew at work. He has associated with him several capitalists in New York and Toronto.—Stockholders of the Silver Peak Mining Co., at their annual election named the following directors: Conrad Wolfe, Spokane, president; F. R. Clark, Spokane, vice-president; Capt. Hugh James, Houghton, Mich., second vice-president and general manager, and Gale Smith, Spokane, secretary. The company owns 200 acres of ground in the Chewelah district. A 90-ft.

shaft, traversed by a 4-ft. vein of copper ore, has been sunk. The ore runs from 4 to 22% copper, and varies in value from \$26 to \$118 per ton. Shipments will be made soon.—The first strike of high-grade silver-lead ore on Beleher Mtn. was made recently on the Churchill mine, the property of the Colville S. & M. Co. The ore in the lower drift assays 37% lead, 7 oz. silver, and \$1 in gold per ton. It has been regarded as a copper camp.

BRITISH COLUMBIA.

The tonnage of ore shipped from and crushed at the Rossland mines during the week ending July 6 was as follows: Centre Star, 3,157; Le Roi, 1,505; Le Roi No. 2, 455; and milled, 700 tons. Total, 5,817 tons of ore. The drift from Centre Star guleh into the Idaho is still in good ore. Work is being done on the 300, 400, and 450-ft. levels of the Iron Mask. The Centre Star compressor has started after a three-weeks shut-down to repair the foundation.—Le Roi was closed for a few days, during which the skipway was extended from the 1,350 to the 1,650-ft. level. A new crusher has been put in, and new wire ropes on the aerial tramway. On the Spltze, they are still driving east and west on the 200-ft. level.—At Le Roi No. 2, development on the You Know and Surprise has been hampered by a lack of men. The new ore-shoots between the 700 and 900-ft. levels are being examined.—Work has begun on the California Giant, in the long cross-cut tunnel to the north. A shaft will be sunk 350 ft. by contract. W. Y. Williams is the manager.—The ore-shoots on the 1,000, 850, and 750-ft. levels of the White Bear are being opened.

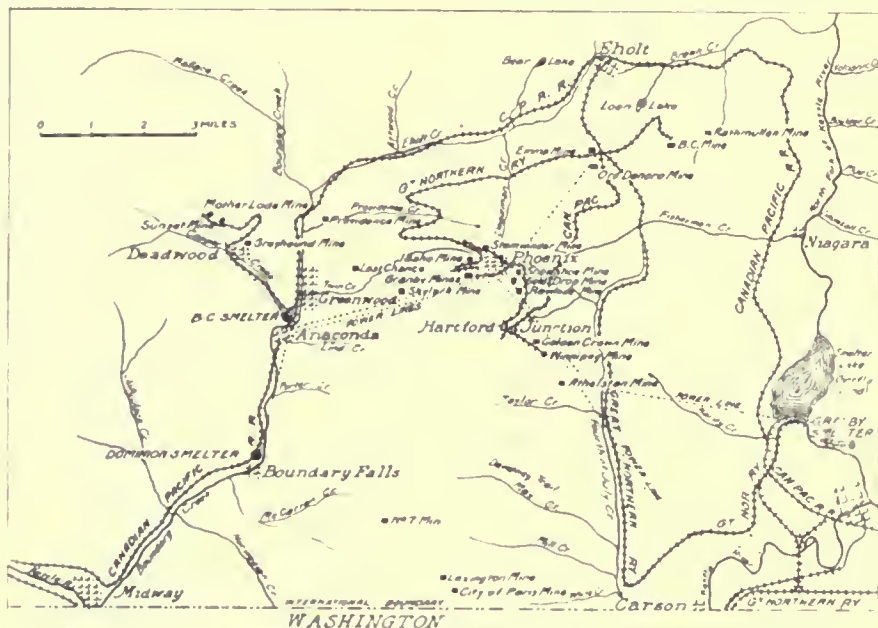
At the Consolidated company's smelter at Trail, 3,972 tons of ore were handled during the week ending July 6. In addition to the Rossland shipments, ore was sent from other mines as follows: St. Eugene, Moyle, 153 tons; La Plata, Kokanee creek, 58; Arlington, Erie, 42; Alamo, Idaho, 30; Providence, Greenwood, 30; Spokane, 30; Ottawa, Slocan, 24; and Libby, 13 tons of ore. A good supply of coke is arriving.—The Northport smelter has received 1,505 tons of ore during the week, and three furnaces are in operation.

The Boundary mines shipped to the smelters during the week as follows: Granby smelter from Granby mines, 17,630 tons. To British Columbia Copper Co.'s plant from Mother Lode, 4,667 tons; from Snowshoe, 5,010; and from Oro Dinero, 3,391 tons of ore. To Dominion Copper Co.'s smelter from Brooklyn, 1,728 tons; from Idaho, 992; Rawhide, 1,760; Sunset, 1,225; from Mountain Rose, 140 tons of ore. Total shipments for the week, 36,543 tons, and for the year to date, 536,919 tons of ore. The Boundary smelters treated ore as follows: Granby smelter, 18,919; B. C. Copper Co.'s smelter, 13,226; Dominion Copper Co.'s plant, 5,845 tons of ore, making total shipment for the week, 38,000 tons, and treatment for the year to date, 536,919 tons of ore.

At the Cariboo-McKinney mine 15 men are employed.—The Granby smelter had eight furnaces in blast this week, but the supply of ore was too scant to keep them all running and only seven are now in operation. The Granby company has just paid its seventh dividend of \$405,000, being at the rate of 3% quarterly on the issued capital of \$13,500,000. This makes a total to date of \$2,563,630 paid by this company. Improvements are being made on the ore-bins, and when completed there will be storage room for 15,000 tons of ore and 5,000 tons of coke.—The North Star Mining Co., at East Kootenay, has issued a report showing the net profits of the year to have been \$27,000. About 1,600 tons of high-grade silver-lead ore was shipped. The exploration work carried on from the Kellogg shaft was

stopped in February, but diamond-drilling has been going on since that time. To the north and west of the Kellogg shaft 558 ft. of exploratory work has been done.—The manager's report of the Rambler-Cariboo at Slocan states that the vein has not been encountered in the 4,500-ft. tunnel or the cross-cuts, and work was carried on for 295 ft. in the direction that would get under the ore, in order that a raise might cut it. The raise was put through 115 ft. and reached the 1,250-ft. level, where a cross-cut 47 ft. long cut the vein.

The report of W. F. Robertson, the Provincial mineralogist, showing the mineral production for last year, has been issued. It shows that the British Columbia mines produced \$24,980,546 in 1906, which is 11.2% greater than 1905, 31.6% greater than in 1904, and an increase of 42.8% over 1903. The increase was due principally to Boundary and coast regions, with a slight increase in the Cassiar district. East Kootenay and Cariboo districts held their own in 1906, and the mines of Lillooet and West Kootenay showed a decrease, especially Slocan. Exclusive of coal, 1,963,872 tons of ore were mined, and shipments were made



Part of British Columbia.

from 154 mines, 41 of which shipped in excess of 1,000 tons. During the year 2,990,262 oz. silver, 52,408,217 lb. lead, and 42,990,488 lb. copper were produced.—The total lead output of Kootenay for the year was about 18,000 tons, about one-third of which was treated at the Hall mines smelter. The St. Eugene mine was responsible for most of the output.

A circular recently issued to the shareholders of the Ymir Gold Mines Co., announces that a raise from the 1,000 to the 700-ft. level is completed and that good ore has been developed by it. The 20 stamps will soon be dropping. H. G. Nichols is the manager.—Reports from the superintendent of the Moresby Island Syndicate mines, state that the Collision Bay group is showing up well. R. J. Leckie is the president.—The Diamond Vale Coal Co., operating in the Nicola valley, will soon be shipping 500 tons per day. Two exploratory tunnels have been run, and the railway switches are finished.—The Bear hydraulic mine on Cunningham creek, near Barkerville, is being examined by engineers.—A contract has been let to drive a 300-ft. tunnel at the Enderby coal mines, where good coal has been discovered.—The Eva mine, at Camborne, will have a second stamp-mill, with 100 stamps. This property has been paying dividends for two years, and when 120 stamps are dropping, the production will be increased.—The Silver Dollar mine, that has been developed for five years by Indiana capital, has a new 40-stamp mill.—The Broadview mine, eight miles east of Beaton, has been operated since last September by Cincinnati people, who purchased it for \$35,000. A 500-ton concentrator has been planned for the property.

Special Correspondence.

Butte, Montana.

Smoke Litigation.—Discovery in the Greenleaf Mine.—Good Development in the Corra.—Butte-Montana Co.—Prospecting on the Continental Divide.

According to rumors a decision in the injunction and damage suit brought against the Anaconda and Washoe companies on account of smelter smoke, by a syndicate of farmers in the Deer Lodge valley, may be expected within a month or six weeks. The farmers look for an injunction to stop operations at the big Anaconda smelter, and it is conceded that they will be awarded substantial damages by the Master in Chancery, who has the case under consideration. The farmers and their attorneys base their expectations on the Federal Court decision in a case against the smelter at Ducktown, Tenn., a case claimed to be identical with that of the Anaconda and Washoe, except that the latter is much stronger for the farmers than that of the Ducktown case. In the latter the company was given time in which to settle with the complainants, and the injunction does not go into effect until the first of October, and then only if the complainants ask for it. Before the suit was brought against the Anaconda and Washoe, the latter could have settled with the farmers by buying their land at \$18 per acre, and the entire valley could have been purchased for about one million dollars. It is understood that the legal department of the companies favored a settlement on some compromise basis, but that the operating department opposed it, and insisted on a fight to a finish.

The vein cut in the shaft of the Greenleaf by the Boston & Montana Co. is estimated to be 11 ft. wide at the point where it was cut at a depth of 840 ft. It does not contain much commercial ore there, but has several stringers of copper sulphide. The vein is typical of Butte, it strikes almost east and west, with a strong southern dip. It is probable that a cross-cut will be run to the vein at a depth of 1,000 ft.—The shaft of the Badger State has reached a depth of 450 ft., and will be sunk at least 1,800 or 2,000 ft., and no cross-cutting will be done above the 1,000-ft. point. The Badger State is also owned by the Boston & Montana Co., and the work on it is in charge of Edward Renouard. The Badger State has one of the rich veins of the North Butte Co., and it is for the purpose of developing it that the deep shaft is being sunk.—The Alliance Co. has made several shipments of ore during the past week, and could have shipped more but, like other small companies, it has been unable to get cars from the railroad. The Alliance is stopping on the 200-ft. level, and has a lot of ground opened on the 300. The Farrell Co., which is operating through the Alliance shaft, is making good headway in developing its vein on the 200-ft. level.

The Butte Coalition Co. has made an important strike in the Corra mine, at a depth of 2,100 ft. The Corra has been a low-grade mine, and was one of the properties taken over from the United Copper Co. at the time of the settlement of the Heinze-Amalgamated litigation. During the Heinze operation of the Corra the only vein of importance was on the 1,600-ft. level, and that appeared to pinch out. The new owners were doing some exploration work when a vein of sulphide ore, running at right angles to the orebody on which Heinze had been working, was opened, proving to be a large lode of low-grade ore. The Coalition Co. then opened the vein on the 1,500 and 1,100-ft. levels and has been mining it, and at the same time has been sinking the shaft. Some time ago

the apex of another vein was cut at a depth of 1,900 ft., and last week a cross-cut was run on the 2,100-ft. level, and a big body of first-class ore opened. The vein at the 2,100 is 46 ft. wide and the report from the mine is that nearly the entire width is first-class. Some driving has been done on the vein and as yet the ore continues of the same extent and quality as in the cross-cut. The belief of the management is that the Corra is destined to become one of the best mines of the Coalition Co. The mine is in the Walkerville part of the district and a short distance southeast of the Alice mine. It is the farthest north of any producing copper mine of consequence. The shaft is now down 2,200 ft. and is to be connected at that depth with the Diamond mine for purposes of ventilation, drainage, and safety.

The Butte-Montana Mining Co. is engaged in an effort to raise money sufficient to take up the bond on the Alex Scott mine, which will fall due in August. The company is offering treasury stock in Butte at 50c. per share, accompanied by a receipt from the First National bank, in which the latter guarantees the return of all subscriptions in the event the bond on the property is not taken up. About 50,000 shares are offered in Butte, and the remainder of the money is to be raised at Pittsburg. The bond is for \$150,000, and \$20,000 has been paid on it. The company claims it has \$1,000,000 worth of ore in the Alex Scott, and the reason offered for not taking out some of it and paying for the property is that the company, under the conditions of the bond, would have to pay 25% royalty to the owners of the property, but which it is saving to the stockholders by not mining the ore. The company is sinking the shaft of the Alex Scott, which is down between 900 and 1,000 ft. The shaft is to be made 1,500 ft. deep.

The Corry people, who are operating mines in the Continental district on the mountain range east of Butte, are preparing to sink a new shaft. The work on the Rex claim has been temporarily suspended, as the object of the work has been attained. The Rex shaft is only 160 ft. deep, but the showing in it is good, a fine vein having been opened. The intention of the Corrys is to sink several other shafts on different portions of their property and develop them sufficiently to demonstrate their value. They are building a sawmill near the site of the proposed shaft and will provide their own timber, the claims being well covered with it. An air-compressor is also being put in place. It is the intention to run a large and long adit from the west side of the range to open the property at a depth of 2,000 ft. as soon as the surface work is completed.

Mexico City.

Consolidation of Railroad Companies Under Government Control.—Details of the Scheme.—Hope of Better Service.—American Society of Civil Engineers.—Convention in Mexico.

When writing my letter of last week the wish was father to the thought, and I was not aware of the fact that the actual merger of the National and Central railroads of Mexico was so near consummation as it is shown to be in issue of the *Official Daily* (the Government organ), of Saturday, July 6. This contains a draft of the law that Congress will be asked to authorize for the merger of the present lines controlled by the Government with the Central under the name of the National Railways of Mexico, organized as a limited liability stock company under the laws of Mexico with the home offices in the City of Mexico. The incorporators are to be the Mexican Government together with a group of stockholders of the present National Railway Co. of Mexico, and the Mexican Central Railway Co.,

and in order that a Mexican official may act for the Government it is to be expressly stipulated that one need not be a stockholder to be a director of the company; and nothing shall be allowed to prevent the Government from having control of the stock, or a majority holding, in the case of either an increase or decrease of the capital stock except by special act of Congress. The first organization will be with a capitalization of P460,000,000, of which P60,000,000 are to be first preferred shares, P250,000,000 second preferred, and P150,000,000 ordinary shares. The first preferred shall come first to the extent of 4% per annum dividend, before any payment is made on other shares, but said dividend shall be paid only

redeemable between the year 1917 and 1957 by means of a special sinking fund, though the company reserves the right to redeem before 1957 and may arrange to refund at 5% above the nominal value; the general mortgage bonds may not exceed P372,000,000, bearing 4% interest and redeemable between 1937 and 1977, but no arrangement can be made to refund above par as may be done in the case of the preferred. Both classes of bonds are guaranteed by a mortgage upon all the present and prospective holdings of the company, and the general mortgage bonds are further guaranteed by the Mexican Government. It is certainly to be hoped that the same may be consummated with the least possible delay,



Map of Mexico.

when earned and shall not be cumulative. The second preferred shall, after the payment of 1% on the first, be entitled to a 5% per annum dividend, before any payment on the ordinary, but likewise conditional, as in the case of the dividend on the first preferred, upon the earnings and non-cumulative. Any balance available from the net earnings in any year, after the payment of 1% on the first preferred and 5% on the second preferred, will be distributed among holders of the second preferred and the ordinary shares without distinction between the class of said shares. The initial shares, besides a block to be allotted to the Government, will be used for the acquisition of the properties and securities of the present National Railway Co. of Mexico and the Mexican Central Railway. The company may also issue preferred mortgage bonds and general mortgage bonds, the former to be limited to P162,000,000 bearing 1 1/2% interest and

and judging from the recent earnings of the companies to be consolidated, it should be an excellent investment for the general public; and the merger should enable a great general saving by a material reduction of office and operating force and expenses and an increased earning by more profitable routing of all goods handled. A very material improvement in the general railroad services throughout the Republic should be one of the immediate results. Many of the much-needed branches will be built, and the several transcontinental lines will be pushed rapidly to completion. And the company may acquire other roads already built or to be built as the needs or advisability of obtaining such are made evident. The annual convention of the American Society of Civil Engineers held its first session in Mexico City on Monday evening, July 8, the day having been given to trips around the City as guests of the tramway company.

Tuesday was given to a visit to the President's home and the military school at Chapultepec and the City water works as guests of the Water Works Commission, with a business session at night. Wednesday is to be given over to sessions morning, afternoon, and evening. Thursday and Friday will be spent in a trip to the power plant of Necaxa, as guests of the Mexican Electric Light & Power Co., while Saturday is to be taken up with regular sessions. Monday, July 15, the Society will be the guests of the Mexican Government on a visit to the City drainage works. Tuesday a trip is to be made to Cordoba and Orizaba, while on Wednesday, July 17, those who desire will be taken over the line of the Tehauntepec National railroad as the guests of S. Pearson & Son. The subjects to be discussed during the convention are to be under the general heads of 'Water Supply,' 'Foundations,' 'Pavements,' 'Electric Railways,' and 'Gas Engines.' It is expected to be a most satisfactory gathering, and several hundred engineers are in attendance. L. M. Terry and associates, of New York, who recently purchased the Concepcion and Cocineras mines, in the Santa Eulalia district, of Chihuahua, for \$60,000, have started development work. Mr. Terry and his friends now control about 270 acres of mineral land in the proved part of the Santa Eulalia district, —A. W. Geist of Guadalajara has secured an option to purchase the Estrella mine, in the State of Jalisco, from Felix Araiza of Guadalajara for \$100,000. — Regular shipments of ore are now being made from the Magistral copper mine in the Etzatlan district, of Jalisco, to the San Luis Potosi smelter. The ore runs about 9% copper and carries gold and silver. The mine is owned by the Magistral Mining Syndicate, which has its headquarters at Los Angeles. M. N. Graves is general manager.

Salt Lake, Utah.

The Garfield Concentrator.—Ontario Drainage.—Heinze's Operations. — Shipments From Tintic.—Dividends. — The Western Pacific Railroad.

The fourth section of the new Garfield mill of the Utah Copper Co. has been placed in commission and is now reducing to concentrate 2,000 tons of ore daily. The Copperton plant, owned by the same company, and situated in the lower Bingham canyon, is treating 1,000 tons daily. The management states that the company is now producing on the basis of from 30,000,000 to 35,000,000 lb. copper annually. The fifth and sixth sections of the Garfield mill will be in operation about August 1. —A receiver has been appointed for the property of the Silver King Consolidated mine at Park City, and W. H. Shearman of the Commercial National bank of Salt Lake City has been named. The company has an indebtedness of about \$75,000. The mine is equipped with one of the finest hoisting plants in Park City and a great amount of money has been expended in development without finding ore of commercial value. —The pumping operations being carried on by the Ontario Silver Mining Co. at Park City are progressing satisfactorily and the management has expressed the confidence that the water will be lowered to the adit-level within a short time and the task of removing the obstructions in the adit resumed.

It is believed here that the plans of F. Augustus Heinze in this State in regard to the building of a new smelter are about to mature. While no definite information has been released from an official source as yet there is little reason to doubt that the agents of Mr. Heinze have secured the ground required for a site and that it is outside the agricultural districts of the Salt

Lake valley. The Miners' Smelting Co. has been organized in the State of Maine with a capital stock of \$10,000,000. This is believed to be a Heinze enterprise and it is said the proposed smelter will have a capacity for the treatment of 3,000 tons of ore daily. The mines in Utah in which Mr. Heinze figures conspicuously are the Bingham Consolidated properties, Silver King Coalition, Western Utah Copper, and Ohio Copper. An option has also been secured on the Bluestone copper mine at Yerington in Nevada.

The ore and bullion shipments from the Tintic district last week aggregated a total of 111 carloads, the contributing mines and amounts being: Ajax, 1; Beck Tunnel, 9; Bullion Beck, 5; Centennial Eureka, 34; Colorado, 6; Carisa, 8; Eagle & Blue Bell, 4; Grand Central, 3; Lower Mammoth, 5; La Clede, 1; May Day, 1; Mammoth, 5; Ridge & Valley, 3; Star Con., 1; Swansea, 1; Sunbeam, 1; Scranton, 7; Tintic Iron, 6; Uncle Sam, 5; Yankee Consolidated, 4 carloads. Four Tintic companies have posted dividends this month, the Colorado Mining Co. taking the lead with \$120,000; Beck Tunnel, \$40,000; Grand Central, \$10,000; Lower Mammoth, \$9,500. The Colorado began paying dividends three months ago, two of \$40,000 each, making the total to date, \$200,000. Recent developments in this mine have been of such a satisfactory character that it has come to be regarded as being one of the big mines of the State. Some are of the opinion that it will even surpass the Centennial Eureka.

The Western Pacific railroad, now building toward San Francisco, is completed westward from Salt Lake about 140 miles and official announcement has been made that the operation of regular trains will begin some time in August between Salt Lake City and Steptoe, Nevada, the latter being the junction point with the Nevada Northern railroad, which has Ely for a southern terminus. The Western Pacific route will materially reduce the distance by rail between Salt Lake and Ely and will in all probability get the bulk of the passenger business between the two points.

A. J. Bettles, the mill manager for the Boston Consolidated, has come out with a statement to the effect that he expects to have the first unit of the new concentrating mill of this company ready for operation not later than August 1, and that it is the intention to begin work on the second unit by the time the first one is out of the way. The completion of the second will eventually bring the capacity of the plant up to 6,000 tons of ore per day.

A Michigan operator, J. R. Van Evera, has secured a controlling interest in the Little Chief mine at Tintic. Jesse Knight and associates of Provo have also purchased a controlling interest in the Sioux Con. mine in the same district.

The strike of employees in the Silver King mill has been settled. The men agree to return to work on the old schedule on the assurance that the wage matter will be taken up later—when the pending consolidation is finally completed. —The Nevada Utah Mines & Smelters corporation has purchased the Imperial mine in Beaver county; also, the Manhattan group at Pioche, Nevada. It is said the company has \$1,000,000 in the treasury after having paid for the above-named properties.

The management of the Little Eddie Mining Co., operating at Bingham, has reported important developments. In the adit, through which the main development of the property is conducted, a large body of ore has been encountered. Edward McCarriek of Salt Lake is manager. —The Ophir Hill Mining Co., at Ophir, has secured an option on the Hidden Treasure mine in Dry canyon and a compressor plant is being installed.

Toronto, Canada.

Labor Troubles.—Activity at Larder Lake.—Exploration in Labrador.
Shipments from Cobalt.

A general strike of union miners at Cobalt was declared this morning and about 2,000 men are idle. At a union meeting held on Saturday, July 6, it was resolved to oppose the schedule of wages adopted by about 30 of the mining companies, and to strike wherever this schedule had been signed by the mine owners. A union schedule was drawn up fixing the pay of surface men about 50c. per day higher than the rate of the mine owners' schedule, and demanding a 10-hour day for surface workers (8 hours on Saturday) and an 8-hour day for all underground work. A deputation was appointed to wait on the mine owners who had not signed the schedule and request that they meet the union's demands. About 600 miners have joined the union during the past week.

The strike at Cobalt, which during the fore part of the week practically closed up nearly all the mines of the Cobalt district, had not at last accounts affected Larder lake, where a good deal of activity was reported. An important find was made on the Lucky Boy's property, consisting of a 20-ft. vein of copper running along the northeast arm of Larder lake near the Dr. Reddick claim. The vein also carries gold. Development work has commenced on the 14-ft. vein recently found on the Larder Central Goldfields location and the free gold in the ore is found to increase with depth. Good discoveries are reported at Moosehead lake, some eight miles north of Larder City, samples brought by prospectors showing native gold and native copper. The region has never been prospected till this year, and is now attracting much attention. The belief is general that the country lying between Larder lake and Abitibi, 35 miles to the north, is all a gold producing area.

A party of prospectors headed by C. H. M. Johns, of Toronto, leaves shortly to look for gold in the wilds of Labrador. They are understood to be working in the interests of American capitalists who are in possession of information indicating the particular region where gold is likely to be found, but their precise destination is kept a close secret. Dr. Dowling, a well known geologist, who has charge of a party sent out by the German Development Co., of Montreal and Ottawa, to explore the Rocky Mtn. region, reports the discovery of coal deposits near the Yellow Head Pass, where the Grand Trunk Pacific and Canadian Northern railways will cross the mountains.

Ore shipments from Cobalt for the week ending July 6 amounted to 319 tons, the following being the shipping mines: Buffalo, 60 tons; Coniagas, 136; La Rose, 30; McKinley-Darragh, 24; Nipissing, 51; Imperial Cobalt, 18 tons of ore.

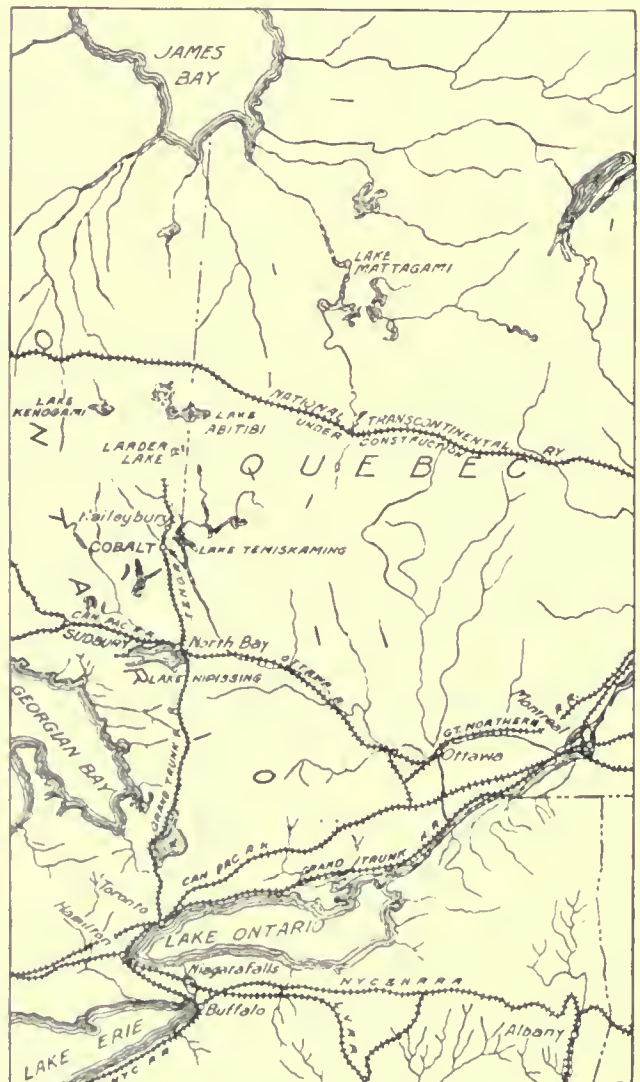
The old Wright silver and lead mine on the Quebec side of Lake Temiskaming, which has been closed down for a year owing to heavy smelter and transportation charges, is to be re-opened. The Del Norte Smelting & Reduction Co., an Arizona corporation, with \$10,000,000, has secured control, and will erect a smelter to treat the output at Ville Marie, Quebec, some 13 miles across the lake from Halleybury, Ontario. The contract has been let, and the work is to be completed in one year. Six other shafts are being put down near the Wright, activity being stimulated by the prospect of a smelter in the neighborhood. The town of Ville Marie is assisting the enterprise by giving a free site, a cash bonus of \$8,000, and exemption from local taxes for twenty years. It is also anticipated that a supply of ore for treatment will be furnished by Larder Lake, and the regions farther to the

north. The company has not yet decided as to whether they will be able to handle Cobalt ores.

Pioche, Nevada.

Railroad Construction.—Nevada-Utah Co.—Ohio-Kentucky.—The Phoenix Reduction Co.—Increased Activity.

The branch of the San Pedro, Los Angeles & Salt Lake railway (generally called the Clark road), now under construction from Caliente to this place, is progressing fairly well, although it has not come forward quite as rapidly as we expected. The Clark road is re-building, reinforcing, or otherwise protecting over 50 miles of its line from Caliente southwest, which was washed out by the floods of last winter, and must use a force of laborers that it might otherwise spare for the Pioche branch. Of



The New Mining Regions of Ontario.

this branch the grade is completed for more than two-thirds of the distance, and track has been laid eight miles out of Caliente. There was delay in tracklaying for some weeks, waiting for the mechanical tracklayer to come from the Las Vegas & Tonopah Railroad, but it seems that it will be needed on that line so long that it was decided to go ahead and lay the rails by hand. The railroad company expects to open the line to Bullionville, 12 miles below here by wagon-road, this month, clear through to this place in September.

The Nevada-Utah Co. is doing a little house-cleaning, while waiting for the railroad to bring in the vast amount of construction material required by them. They have erected out of lumber hauled on wagons a boarding-house and a bunk-house and are ready to ship ore from several

places on their property. Their principal shipper at first will be the Jack Rabbit mine, 15 miles west from here, where it is said that they have half a million tons of ore opened up above the adit level. It is a silver-lead ore, carrying a high percentage of lime (being a replacement in limestone), and of course it is in eager demand at the smelters.

The plans of this company contemplate greatly increased hoisting facilities and a pumping plant adequate to sink to a depth of at least two thousand feet. A light and power plant of at least 1,000 h.p. is to go in on the hill just as soon as it can be installed after the railroad is available. This will furnish the town of Pioche with electric light and also serve the needs of the company for light, hoisting, pumping, and air-compression. They will build a large concentrator, as well as a sampler, near the depot. At Jack Rabbit they will erect a 500-h.p. power-plant for their own use, and perhaps larger, in order that they may sell power to the neighboring camps. They will start a vigorous system of development on the old mines under their control. Most of those on the hill are already connected underground. This system will be perfected and all the ores brought out either through the main hoist on the hill, or through the old Pacific adit.

Since my last letter this company has elected a new president, George W. Learned, of New York. C. H. Swanton of Pioche is general superintendent of all the properties in Nevada. There has been a great deal of speculation as to whether the company is now actually dominated by Thomas W. Lawson, of Boston, but no one in this region seems able to answer the question. Since they anticipated the provisions of their option, and filed deeds conveying to them complete title to all their properties in this region, the news has been published that they have also purchased the Manhattan group of claims near the summit of Stampede Gap, ten miles west from here.

The Ohio-Kentucky, of which Samuel Newhouse is president, is crowding development. This company owns a large amount of the most valuable property on the hill, and is today developing with most vigor the Susan Duster lode, by an incline shaft. The mine is a new one. It is equipped at present, for development only, with a 25-h.p. gasoline hoist. The shaft was started on a 60° incline for reasons best known to the management. This will probably be used for ventilating and for dropping ore to a lower level. The shaft, which has reached a point over 50 ft. below the third level, is still going down. From a drift on the second level a winze has been sunk 35 ft. and a raise is coming up from the third level to meet it. A winze is going down from the third level and driving both ways on the vein is proceeding also on that level; later cross-cuts will be run from both of these drifts. These workings are simply to test the orebody. In places, where the full width of the vein has been disclosed, it has been found to be over 20 ft. wide. The ore is a complex sulphide of lead, zinc, and iron, carrying gold and silver. Only so much as comes out in development is being hoisted and that at present is going onto the dump for eventual shipment.

The same interests that control the Ohio-Kentucky, but in different proportion, control the Phoenix Reduction Co., which is going to be one of the institutions of this region.

Besides the old tailing-piles at Bullionville and Dry Valley, where the ores of the Raymond Ely and Meadow Valley companies were treated in the early days, this company owns a group of claims $2\frac{1}{2}$ miles southwest of Pioche, known as the Prince group. This is a low-grade silver-lead ore, carrying an excess of 30% iron. It is also a replacement in limestone and from its nature evidently such an ore as the smelters greatly desire.

E. L. Godbe, the general manager, tells me that the ore outcrops practically 1,000 ft. in length by from 100 to 200 ft. in width. They have recently installed a 40-h.p. gasoline hoist over a shaft already down 120 ft. At the 100-ft. level they have run in a cross-cut over 40 feet.

Cripple Creek, Colorado.

Mill for the Independence.—Pumping in the Gold Coin.—Operations of Leasing Companies.—Dividends Paid.—Ore Treatment.

The shareholders of Stratton's Independence, Ltd., at a special meeting recently held in London, have authorized the erection of a mill for the treatment of the dump and low-grade ores of the mine. Operations will commence July 8, clearing the site, which is to be where the houses of Strattonia now stand. The mill will be a combination of concentrating and cyaniding and is to be built in units, each of which will have a capacity of 6,500 tons per month, to be made up of approximately 5,000 tons from the dump and 1,500 tons from the mine. It is estimated that there are approximately 600,000 tons of rock on the dump that will average about \$3.50 per ton.

The water in the Gold Coin shaft of the Granite Gold Mining Co., situated in the city of Victor, has been lowered to the 1,200-ft. level. This has been accomplished by means of the pump on the 1,000-ft. level, the sinker on the 1,100-ft. level, and two bailers in the shaft. It is stated that the expense of keeping the water down to this level will be borne by the Granite, Strong, Ajax, and Portland companies.

Cavanaugh & Co. who have been operating on the lower levels of the Wild Horse mine on Bull hill, have turned over their lease to the owners of the property, the United Gold Mines Co. The lessees have been mining the low-grade oxidized ore from these levels, treating it in the Wild Horse mill. A final clean-up is now being made by them at the mill. Operations were conducted through the old shaft, which the company has taken over, but the latter will allow the subleases, granted by Cavanaugh & Co., to continue in force. The above parties also have a lease between the 200 and 400-ft. levels of the main shaft where they are mining a 4-ft. vein averaging \$40 per ton.—The El Paso Gold Mining Co. paid a dividend to the stockholders of \$24,500 on the 25th ult., and the Elkton Consolidated G. M. Co. a dividend of \$37,500 about the same date.

The total of dividends paid by companies operating in this district reaches \$1,200,000 for the first six months of 1907. These are the figures that are made public; several companies do not give out any information, and these, together with the profits accruing to lessees, would greatly swell the total. The Golden Cycle Mining Co. is shipping 12 cars daily to its mill at Colorado Springs. The mill is also treating custom ores; a total tonnage of about 700 tons per day is now being handled. The use of amalgamating pans and plates in the mill has been discontinued, as it was found impossible to prevent the plates from scouring, and to keep the mercury and amalgam from getting into the percolation tanks. Blankets have been substituted for the plates and they are giving satisfaction. The use of plates to catch the shot gold obtained by roasting coarsely crushed ore has the further disadvantage that the coarse pieces of sylvanite require a long exposure to the heat to free them completely of their tellurium, and until they are free of tellurium they will not amalgamate. The trend of sentiment in the district seems to be strongly toward all-sliming methods, and the Vindicator and Portland companies are engaged in experimenting with new types of filter-presses, to ascertain whether they are of practical value.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

IN using the hydraulic elevator in alluvial mining, the height to which the gravel can be lifted is one fourth the effective head.

AN occurrence of alluvial copper mining is known in the Sacramento mountains, in Otero county, New Mexico. There the overburden above a lava formation containing chalcocite has been sluiced successfully.

THE rare metal tantalum is now quite extensively used as a filament in incandescent lamps. While tantalum lamps are more expensive than the bulbs fitted with ordinary carbon filaments, they are longer-lived and give a much brighter and whiter light. It is figured that one pound of tantalum metal is sufficient for 23,000 lamps of 25 candle-power each.

WASHED METAL is cast iron from which most of the silicon and phosphorus have been removed by the Bell-Krupp process without removing much of the carbon, so that it still contains enough carbon to be classed as cast iron. The name 'washed metal' is extended to cover this product even if its carbon is somewhat below the proper limit for cast iron.

INGOT IRON is steel cast into an initially malleable mass and containing so little carbon or its equivalent that it does not harden greatly on sudden cooling. The word is rarely used in English, 'low-carbon steel' or 'soft steel' being generally used in its place. In America the line between soft steel and half-hard steel is usually drawn at a carbon content of about 0.20 per cent.

MAGNETIC SEPARATION has heretofore been confined principally to the separation of iron ores from gangue, or from other heavy minerals. Magnetite is separated directly, but limonite, hematite, and siderite are given a preliminary roast to convert them into the magnetic oxide. The separation of blende from pyrite, or other iron ores, is readily effected magnetically after such a preliminary roast.

MALLEABLE PIG IRON is an American trade name for the pig iron suitable for converting into malleable castings through the process of melting, treating when molten, casting in a brittle state, and then making malleable without remelting. The term should be used with care to avoid confusion. This material is also called in trade in America malleable iron, but this use should be avoided, because malleable iron has the older and (in Great Britain) firmly established meaning of wrought iron.

THE world's output of aluminum is about 15,000 tons, of which the American concern situated at Shawenegan Falls, Canada, supplies about 20%. The metal is being availed of in so many ways in recent years as to make it a precious one. The only method by which aluminum has been produced in any considerable quantity is by the Hall process of manufacture from the oxide, but an American inventor has produced a process for refining the metal by electrolysis which may bring about its wider use under more advantageous conditions.

A PRACTICAL method for discovering the presence of sulphur in petroleum is the following: Heat one or two grams of oil in a hard glass test-tube with a small piece

of sodium, allowing the condensed vapor in the upper part of the tube to run back on the sodium. Finally heat until completely dry, add a little water, and place a drop of the solution on a silver coin. A gray or black spot showing on the coin indicates the presence of sulphur in the original sample. Another method, that may be used if the oil is colorless, is to boil it for a few minutes with alcohol and a few drops of ammonia. Then add silver nitrate solution, and a brown coloration proves the presence of sulphur in the oil.

THE condition of the monazite market in the United States in 1906 was fairly strong, despite the fact that the price of thorium nitrate, which is manufactured principally from monazite, was reduced nearly one-half early in the year by the German thorium combine. Though made with the intention of killing all competition, this cut has resulted only in the temporary closing down or the bankruptcy of a few of the smaller companies. The economic value of monazite lies in the incandescent properties of the oxides of the rare earths—cerium, lanthanum, didymium, and thorium—which it contains. The cerium goes to the drug trade; the thorium, together with limited quantities of lanthanum and didymium, is used in the manufacture of mantles for Welsbach and other incandescent lights.

A PECULIARITY of the antimony industry is that while antimony ore exists in varying quantity in many parts of the world, three or four countries in turn within the last 30 or 40 years have supplied the bulk of the production. Makers of antimony metal and its chemical compounds at one time were dependent upon Portugal for supplies of ore; the Straits Settlements at another period satisfied the demand, and within the last few years it has been China. The current belief is that prices for antimony metal will continue high until deposits have been discovered which can be worked on as large a scale as those furnishing the shipments that have been made from China. Prospects that Japan, for many years an important factor in the market, will continue to ship appreciable quantities of antimony are not encouraging, as the domestic ore deposits are understood to be exhausted, and supplies from China will not be as plentiful as they have been during the last six years or more.

AVERAGE PRICES of mica vary widely for the different sizes. In North Carolina, the values reported by dealers range from 10c. and 25c. per lb. for stove mica down to five cents and less for electrical mica. Cirkel, in his report on the mica of Canada, quoted prices for medium-quality Canadian muscovite as ranging from 12c. per lb. for 1 by 3-in. thumb-trimmed, to \$1 for sheets 4 by 6 in.; for phlogopite the prices quoted for the same sizes are 10c. and 75c., respectively. The combined specific duty of six cents and ad valorem duty of 20% on rough-trimmed mica would aggregate from 80 to 25% of these prices, respectively. Scrap mica is valued at from \$5 to \$10 per ton in both the United States and Canada. The duty prevents importation of either the Canadian scrap or ground mica. The latter is quoted at from 5 to 10c. per lb., but the ground phlogopite lacks the luster of the muscovite. The present condition of the industry in this country is that the demand is good for the larger sizes of sheet mica for glazing purposes, for which use the muscovite is superior to the darker-colored micas of India and Canada; the smaller sizes of sheet can be cut into electrical mica, and the waste mica is available for the manufacture of micaite and other varieties of built-up mica board and also for grinding into the various grades of ground mica and mica flour. Thus the run of the mine can be utilized, to a great extent.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

Conveying Tailing Through Pipe.

The Editor:

Sir—In reply to your request for further data concerning the pipe-line for conveying tailing, mentioned in your article appearing in the issue of June 29, I beg to say that this line is 5,440 ft. long, of 8-in. cast-iron bell and spigot pipe, $\frac{5}{8}$ -in. thick and joints calked with hemp rope loosely driven into place after having been tarred. It is laid for its first 800 ft. on a grade of $3\frac{1}{2}\%$, after which it has a uniform grade throughout of $2\frac{1}{4}\%$. The pipe-line was most carefully asphalted on the specifications for asphalted pipe contained in the proceedings of the American Institute of Mining Engineers two years ago, and was made by the American Cast Iron Pipe & Foundry Co. at Anniston, Alabama, no special price being paid for said asphalted, which is part of their regular practice, apparently.

The line of pipe passes through a crowded city and has in its construction many curves, the majority of which are on a 14-ft. radius, the curves being made by short sections of curved pipe in 3-ft. and 6-ft. lengths, ordered for that purpose. At the head of this line are two de-watering cones of 20 ft. diam. with 45° sides; these remove about one-half of the water from an 8 to 1 pulp before introduction into the pipe.

The pipe was put into service at the middle of March, 1906, and has been in continuous use up to the present date, having carried approximately 100,000 tons of dry pulp during that time. Careful measurements of the interior diameter of the pipe, made at the expiration of 13 months of service, show that it has undergone no appreciable wear. The total cost of maintenance and up-keep during the 13 months has been 3.57 pesos, spent for paint on one of the viaduct towers. There has been absolutely no other item of expense since its installation.

The pulp is that resulting from crushing through a mill of 80 stamps with a steel wire screen of 26 mesh with 28 wire followed by tube-milling of a portion of the coarse product such that after removal of 38% of the pulp as slime, 52% of the balance nominally passes a 120-mesh screen. At times, however, when the tube-mill has been out of service for replacement of linings, we have run two weeks at a time on straight 26-mesh battery-pulp. On two or three occasions, by reason of neglect on the part of the Mexican in charge of the de-watering cones, the thickness of the pulp has been considerably increased over the normal 4 to 1 proportion and on such occasions a slight deposit of coarse sand in the pipe has occurred, which always gives notice by a whistling noise at a blow-hole intentionally placed in the pipe about 1,000 ft. from its head. This notice always occurs in plenty of time for the error in the thickness of the pulp to be corrected; on two occasions this occurred on night shift and the line filled approximately half-full with coarse sand, but an hour's time was sufficient to clear the line (by the introduction of more water at the head) with no expense beyond the momentary delay. As soon as riffles of sand are formed so as to cause an obstruction in the flow, the pipe develops hydrostatic head above the point of obstruction sufficient to force the sand through. Delays from this source have not caused more than four hours' loss of time in the entire 13 months, and even then they were due to carelessness at the cones, as above mentioned. Normally, month after month, there was not the slightest tendency of the pulp to deposit any sand whatever in the line and

when, due to electric shut-downs or any other stoppage at the mill, pulp ceases to flow into the head of the pipe, the line keeps itself entirely clear without the introduction of water.

At the present capacity of 250 tons per day the pulp runs only $1\frac{1}{4}$ in. deep on the bottom of the 8-in. pipe, running at such speed that the distance between the ends of the line is traversed in about 12 minutes. The additional 80 stamps to be started in September will double the amount of pulp, but the pipe can carry 1,000 tons as easily as the present 250.

The wear is so slight as to be invisible up to date, but in any case, the pulp running only in the lower part of the pipe would allow of the turning of the entire line five times before it was entirely worn out, and we figure that if the line were to become worn out every two years it would only mean two cents per ton carried. The present appearance is that it will last 50 years.

C. W. VAN LAW.

Guanajuato, July 2.

Cyanidation in the Transvaal.

The Editor:

Sir—I must take exception to your Johannesburg correspondent's remarks in your issue of June 8. Possibly he does not understand the matter he criticises, otherwise it is altogether difficult to understand why he should so strongly depreciate the work of the Denny brothers because the local people are apparently unable to estimate accurately the assay-value of their ore.

That the "new metallurgy" consisted merely of a method of assaying is news to me. What the Messrs. Denny announced was that:

(a) The old method of treating coarse sand by a long percolation was wrong in theory and in practice and that in spite of opposition the mines would abandon it in favor of fine grinding, for which purpose they introduced tube-mills.

(b) By the use of tube-mills they expected to obtain not only a higher extraction from the resulting finer grinding, but also a higher output.

(c) A continuous method of slime treatment by having solution occur during the flow or travel of the pulp instead of in special agitators after collection and settlement was cheaper, both in first cost of plant and in working, than the prevalent decantation method.

In order further to increase their extraction they employed filter-presses instead of decantation.

All their points the Messrs. Denny appear to have proved to the hilt. Indeed, the use of tube-mills, starting from the one imported by the Dennys, has now spread all over the Rand; and I note no fault whatever is found with the extraction obtained by the "new metallurgy," and that in the same speech Mr. Albu apparently states his satisfaction with the work of the filter-presses. His one cause of dissatisfaction seems to be his difficulty in obtaining reliable preliminary assays; but this surely should not be insuperable, and is an entirely subordinate matter to the obtaining of the highest proportion of gold at the minimum cost.

I write this because the remarks of your correspondent are calculated to convey a wrong impression, and not because I am entirely in accord with the line taken by the Dennys. They were cautious in their preliminary work on tube-mills; their verdict was amply justified by results. They did a good deal of preliminary work with filter-presses; there, too, their decision seems justified by results. Whether they displayed the same caution in building two new plants depending on solution of the gold by what we may term 'mortar-box contact' would

be a much more debatable subject except for the fact that it appears they provided additional plant for the purpose, but the use of which was not found in practice to be necessary, and I have been advised—not from any source connected with the Messrs. Denny—that Mr. Albu has strongly objected to the expenditure of the money on this precautionary measure, though the vats have been converted to other use.

It looks, therefore, not merely as if the Messrs. Denny have proved their case to the hilt, but that indeed this same system has been adopted in practically all the latest American plants and in a number of those in other territories. To my mind a serious matter against the new system is the difficulty of copper-plate amalgamation. In Australia, pans are successfully used for the purpose, and I have no doubt that other suitable methods will be devised in plenty—possibly by the use of some special alloy for amalgamating plates—now that the need of special effort in this direction is known; but I cannot believe that a method of extracting all the gold in the slime at practically no expense for plant (as far as the solution of the gold is concerned) will be lightly abandoned by the industry (I do not refer here to South African practice only) merely because of a faulty or ineffective method of obtaining preliminary assay-values. The saving in cost of equipment alone is a factor compelling most serious attention.

In conclusion, I am not prepared to admit that the Messrs. Denny have yet made out their case in favor of all-sliming. If the words "finer grinding" are substituted for "all-sliming" there would be general agreement with them, but personally I am of opinion that it is still the most satisfactory and economical method in general practice—with exceptions—to percolate in vats, without expense for power or handling, all the sand suitable for percolation in vats, the remaining pulp receiving the suitable treatment necessary. Apart from the less cost of thus treating the fine sand, we have as yet no reliable data to prove that the extraction obtained from slimed sand, as sand, apart from slimed concentrate or slime, is so much higher as to justify the extra cost of sliming and of handling the slime. There may be ores in which total sliming is preferable, but where the gold is carried in the concentrate or in contact with some softer or more fragile material it is surely cheaper to treat the fine particles of sand without subjecting them to the partially unrecovered expense of further grinding.

ANOTHER CORRESPONDENT.

London, June 26.

A Fundamental Problem.

The Editor:

Sir—May not the difficulty which your correspondents encounter in getting explicit reports from professional mining engineers, and which they attribute to 'hedging,' be partly due to the fact that they expect from us more than we can possibly give? Too often what clients really want is somebody who can see into the ground; and they end by employing the man who can humbug them into thinking he can do it. Let me illustrate:

Some years ago an old gentleman who employed me to make an examination of a 'prospect' in which he had become interested, and which had not opened up as well as he had hoped or been led to expect, found fault with my report. He said, "This report of yours is very interesting, and no doubt very profound; but it does not tell me what I want to know. I want you to tell me in one word, yes or no; is this a great mine, or is it a damned swindle?" Unfortunately I could not answer him that way; it was neither.

So with the rest. They want reports which are emphatically black or emphatically white; but the facts, three times out of four, are neither black nor white, but gray. Great mines are few and far between; and we do not often get called upon to examine them; "damned swindles" are more plentiful, but the promoters generally take good care that honest engineers do not get called in to pass on them. Most often we meet with the 'prospect,' which may or may not ever make a mine. The chances are always against it; but if there were nobody to take chances there would soon be an end to mining. The people who employ us are usually not content with simple advice to speculate or stay out, as the case may be; they say they want the facts, and will decide the rest for themselves. But the sober facts seem to them lacking in definition; and your employer thinks you are hedging, whether you advise him to plunge or not.

GEORGE E. COLLINS.

Denver, July 5.

THE manner of converting iron ore into malleable iron has undergone many changes. It is made from the pig in the bloomery fire or in the puddling furnace, generally the latter. The process consists in melting the pig metal in a reverberating furnace where the flame is made to act directly on the metal, keeping it exposed to a great heat and constantly stirring the mass, thus bringing every part of it evenly under the action of the flame until it loses its remaining carbon. It then loses its fluidity and is formed into a puddler's ball. This is the point or connecting link between cast and malleable iron. The operation of puddling is a most important one, as the quality of iron depends so much upon the skill with which it is conducted. After the puddler's ball has been formed it is passed to a heavy squeezer or steam hammer, the object being to press out the liquid cinder which the ball contains when it is ready to be rolled or hammered. While hot it is generally passed between the rolls and drawn into a bar about 5 in. wide and 3 in. long, which is called a muck bar. To prepare bars for the refining operation they are cut into such lengths as are best adapted to the size of bar or sheet required. The sheared bars are then piled one on the other, according to the quantity of metal necessary to make the finished piece. They are then brought to a welding heat in the heating furnace and passed between the finishing rolls until drawn to the proper size.

JAPANESE CEMENT COMBINATION.—It is reported that a scheme to form a syndicate among cement companies is under consideration among cement manufacturers in Japan. The object of the scheme is said to be to improve the quality of cement, and to check the import of the foreign article. The Okayama, Saga, and Mie cement companies have agreed to incorporate with the Toyo Cement Co. All the companies mentioned are paying fairly good dividends. Upon the completion of the organization of the new company, cement works will be established in Manchuria, and in the northeastern part of Japan.

GALVANIC ACTION sometimes weakens steam boilers. Water is distilled in a steam boiler; therefore it is broken up into its constituent parts, namely, two parts of hydrogen and one of oxygen. In a boiler made of iron with brass trimmings, the iron becomes the positive pole, and in this connection it is well to remember that brass is composed of copper, zinc, and tin, and some of it may contain about 85% copper, thus doing good work as a conductor of electricity. This explains why boiler inspectors are not very enthusiastic in recommending brass feed-pipes and water-column connections.

Some Ore Deposits in the Inyo Range, California.

Written for the MINING AND SCIENTIFIC PRESS
By JOHN A. REID.

The Inyo range, with the White mountains, its northern continuation, is the first ridge east of the highest portion of the Sierra Nevada. It is separated from the latter by Owens valley. There exist ore deposits in this sierra that possess some unique characteristics.

The structure of the Inyo range, simple in broad outline and very complex in detail, is that of a monoclinical fold modified by faulting and igneous intrusions. In certain portions the monoclinical character approaches that of an overturned anticline with axial plane pitching downward to the west. Intense faulting, both of large and small movements, is everywhere present, and plays a vital part in the genesis of the orebodies. In general, the planes of motion are of two series, parallel and transverse to the range.

In the immediate vicinity of the mineral deposits the sedimentary rocks embrace Paleozoic (probably Carboniferous) sandstone, shale, and limestone. Intruded into these are two varieties of igneous rocks, of different ages. The older occurs in dikes and stocks, varying in width from 3 to 100 ft. or more, near the axial plane of the range. On the mining ground these dikes show a rock containing a large proportion of perfectly formed zoned crystals of plagioclase set in a blue-gray ground-mass. The ground-mass is too fine to be resolved entirely by the unaided eye, but shows flakes of biotite, and needles of hornblende in a feldspathic paste. Pyrite is present, but it is largely, if not entirely, secondary. This rock will be referred to as a porphyritic diorite, no microscopic examination having been made. North and south of the ore deposits the porphyritic aspect of the dikes passes by gradations into the normal granitic rock of dioritic appearance composing the larger intrusive masses. The essential minerals are hornblende and plagioclase, with accessory orthoclase, quartz, and biotite. Microscopic investigation may prove the stone a granodiorite or a quartz monzonite. The later intrusive occurs in dikes from 3 to 30 ft. wide, none of which, in the mining ground, reach the surface. The color is a medium dark blue-gray, and the grain fine. Well developed crystals of hornblende, plagioclase, and quartz appear in a finer network of feldspar crystals. In some dikes at a little distance from the mine openings, the rock graduates into a hornblende andesite, or the 'porphyrite' of the older classification. It will be referred to as a quartz-diorite. On the low western foothills of the Inyo range is a large dike of andesite parallel to the axis of the mountains. As far as known it has no connection with ores of any sort.

In the mine openings the older dikes of porphyritic diorite strike parallel to the crest of the range and dip west about 50°. The most important one lies between the limestone on the east and the shale on the west, though near the surface the rocks are badly jumbled. (See Fig. 3.) The other dikes of porphyritic diorite cut the shale. All invariably show the effects of intense dynamic action, and are frequently reduced to the consistency of putty. It is often found that cross-faults, and even quartz veins, and quartz-diorite dikes fail to cross them, and cease upon reaching the semi-plastic material of the porphyritic mass. The strongest quartz vein opened underground wedges out entirely upon meeting the largest of these dikes; their prevailing western dip in the interior of the great fold probably indicates that they were intruded before the completion of a part at

least of the folding. If this be so, and the rock be correlated with the dioritic intrusions of the Sierra Nevada, the present Inyo range is of early Cretaceous age. The later dikes of quartz-diorite strike northwest-southeast, and stand vertical, usually cutting the porphyritic diorite. This stone is commonly fresh, even though badly faulted in the immediate vicinity of the orebodies.

The structural details surrounding the mineral deposits are vitally important. Four faults, or groups of faults, of earlier age than the ores, are found in the mine workings. Two of these, about 300 ft. apart, are of the more important series of north-south movements; the other two, separated by about 900 ft., are east-west cross-fractures. The former stand nearly vertical; the latter dip both north and south. (See Fig. 1.) The eastern and the northern faults are the two larger. Many post-

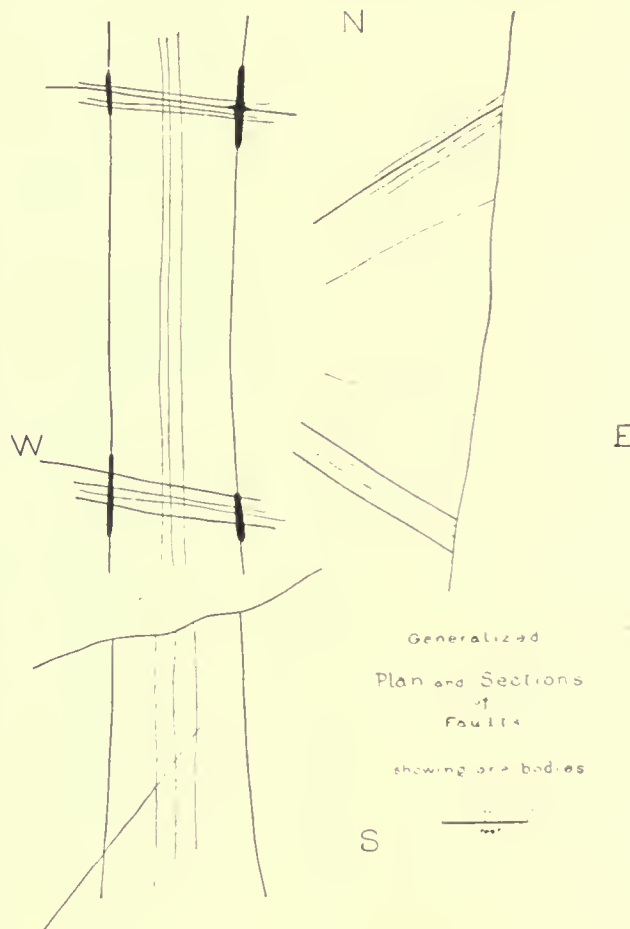


Fig. 1.

mineral north-south fractures are exhibited in the various openings underground.

The orebodies are of three distinct types: in order of relative importance they are: (1) Those deposited in spaces caused primarily by intersecting faults; (2) quartz veins filling fissures; and (3) contact deposits in the limestone near the dikes of porphyritic diorite. There is a slight contact zone along the quartz-diorite dikes. Each orebody not a quartz vein shows characteristics of both first and third types. There is a genetic relationship with the two intrusive rocks.

The largest orebody, as well as the most peculiar and interesting, was formed at the intersection of the east and the north faults. The first stands vertical; the second dips south at an average angle of 45°, steepest near the surface. The shoot therefore pitches to the south. The spaces opened by the two movements were greatest toward the surface, due to the fact that given forces of disruption will produce greater visible effects under a lighter load near the surface than at greater depth. Further, because of the later age of the east-west frac-

ture, and a quartz-diorite intrusion nearly parallel to it, the opening along this fault becomes relatively more important in the lower part of the orebody. The quartz-diorite dike cuts the intersection of the two fault-planes 600 ft. below the surface. The form of the orebody may be compared to that of a short piece of tapering pipe flattened at the big end in one plane, and at the small end in a plane at right angles to the first. The length downward along the pitch is 800 ft.; the thickness in a north-south line at the surface is 200 ft., while at the downward end it is two feet; the width at the surface is 20 ft., increasing below to 75 ft. (See Fig. 2.) From the 600-ft. level downward the orebody continues as a contact seam on the north wall of the dike; above this level the seam leaves the intrusive and follows upward the intersection of the two faults. The minerals were deposited not only at the actual intersection, but also in both fault-fissures near-by, to the greatest extent in the larger north-south opening. A cross-section of the deposit is of the shape of a cross with unequal arms. (See Fig. 1.) The ore is an argentiferous galena, with small amounts of antimony as an impurity. It occurs in nodules in altered limestone, some of which, extracted in the past, are reported to have been 4 or 5 ft. in diameter. Cerussite and anglesite invariably surround the sulphide. The only gangue is calcite, or marbleized limestone; quartz is notably absent. The lead in an oxidized condition does not penetrate the surrounding rock for more than the fraction of an inch; the silver exists in an undetermined form at considerable distance from its original position. In the lower portion of the deposit the silver shows evidence of existing in proportionately greater amount than the lead.

The second type of ore deposit is found best developed in the limestone along the foot-wall of the easterly dike of porphyritic diorite. The contact formation always accompanies the dike, but bears ore only where enriched at cross-fractures. The ore of the contact zone proper is pyrite, now found only as limonite, either in large masses or in pseudomorphs after the sulphide. Gold is contained in small amount. The more valuable mineralization is due to the presence of both sets of faults. The west north-south fault cuts this contact within the mine openings; much movement near the dike, and in the dike itself, has occurred, and the largest orebodies were formed at the intersections of the two east-west planes of fracturing with the contact and the north-south fault. Small nodules and lens-shaped masses of argentiferous tetrahedrite with some quartz, similar to that of the quartz veins next described, are found irregularly distributed along the plane of north-south motion. The second orebody in importance in the mine was formed at the north intersection of cross-faults, though the deposit at the south intersection may yet prove the more valuable. (See Fig. 1.) The ore in this latter orebody shows a considerable percentage of bournonite, the sulphantimonide of lead and copper. Argentiferous galena is the chief mineral in both deposits. The length north and south is a few hundred feet; the thickness is from 1 to 10 ft. Dikes of quartz-diorite are near.

The third type of ore deposit, the quartz veins, is that which has furnished the rich silver ores of the Inyo range. These veins are narrow, from one to four feet wide, and are remarkably irregular in local dip. The dip in general is nearly vertical, or about 85° north, but in detail only a zigzag line could represent it. The strike is northwest and southeast. The effects of faulting are less shown on them than on the other deposits. The most important mineral is tetrahedrite, often the argentiferous variety freibergite, and always containing some silver. Arsenic, lead, and zinc occur in small quantities.

Other minerals are galena, sphalerite, and in some veins chalcopyrite. All were deposited simultaneously. Azurite, malachite, smithsonite, and calamine occur in irregular masses in the limestone adjoining the veins. A little linarite has been reported. A number of the sulphantimonides of silver and copper may also be present; the complete mineralogy of the ore is not yet worked out. The only gangue of the veins is quartz.

The lead-silver ores are genetically connected with the intrusions of the quartz-diorite. The solutions set in motion by them found open channels at intersecting faults, and deposited therein their mineral contents. The largest orebody, described first, shows a small contact seam on the north wall of the dike proceeding upward, and opening out into a large orebody above. Further, this contact seam is well developed only where the dike is near the two systems of intersecting faults. At the time of the deposition of the lead-silver ores the ground was badly fractured outside the main faults, so that small amounts of ore can be found scattered in many places, particularly near the surface. The quartz veins are of later age, though from the facts that they strike and dip nearly parallel with the quartz-diorite dikes, and that there is some similarity between their ore minerals and those of the other deposits, it is thought that they may represent the last effects of the dioritic intrusions. The silicious solutions in small quantities penetrated many lesser fractures, as along the east dike of porphyritic diorite.

The relative ages of the three types of deposits are clear. The contact zone accompanying the porphyritic diorite is oldest. A period of north-south faulting followed, accompanied by east-west movements. The subsequent intrusions of quartz-diorite caused more fracturing, chiefly in an east-west direction, and initiated the deposition of the lead-silver ores. The quartz veins, containing antimonial and sulphide ores, filled fissures formed probably as the last results of the dioritic igneous activity. The absolute ages of the deposits are less apparent. The main contact formation is probably early Cretaceous; the quartz-diorite, with its associated ores, probably, is of early Tertiary age, synchronous with the early andesites of the Sierra Nevada; the quartz veins are but little later than the lead-silver minerals.

Not the least striking feature of the orebodies not quartz veins is the variation of richness with depth. In the lower portions of the deposits there is an absolute decrease in both lead and silver values, but a relative increase of silver over lead. A question now beginning to evoke more and deserved attention is the deposition of minerals in vertical range. In the continuous opening of the largest orebody the rich ore of the higher levels gives place to very low-grade material at the bottom. The galena is practically lacking near the dike, but there are several ounces of silver. The limestone of the Inyo range is noted for similar examples, those seen being small. A typical one is shown in Fig. 4. Here a small, but continuous seam in the bedding planes of the country rock, about an inch thick, is barren of all but decomposed calcareous minerals stained by iron. A few vugs containing calcite crystals show themselves. At the top, on the surface of the ground, is a nodule of solid galena, locally (and appropriately) termed a 'blossom.' The galena is tightly held in the limestone with no decomposition products surrounding it. The fissure leading up to the sulphide apparently stops at that mineral. Not sufficient study of the characteristics of the lead deposits has been made to warrant a truly scientific statement of cause. The facts known are as follows: The lead ores are genetically connected with the dikes of quartz-diorite. Most of these dikes fail to reach the surface. In the

eases observed the ore-bearing tissues are barren of lead minerals near the intrusive, and rich near the surface of the ground. Silver, when present, is in relatively greater amount near the igneous rock.

To sum up, the Inyo range exhibits three distinct types of mineral deposits: Those at the intersections of cross-fractures and containing lead-silver ores; ordinary quartz veins carrying antimonial and sulphide ores of copper, lead, silver, and zinc; and contact deposits showing chiefly iron ores, with traces of gold. The lead-silver ores are genetically related to the dikes of quartz-diorite, and the quartz veins are of a slightly later age, probably connected with the last stages of the expiring igneous activity of the early dioritic intrusions. The relative ages of the deposits are, from earliest to latest: (1) Contacts between limestone and porphyritic diorite; (2) lead-silver ores; (3) quartz veins. The geological ages range probably from early Cretaceous to early Tertiary. The Inyo mountains are notable in the large number of ore deposits, and should eventually become an important mineral region.

MALLEABLE CAST IRON is iron which when first made is cast in the condition of cast iron, and is made malleable by subsequent treatment without fusion. Although the

COAL SUPPLY OF THE ORIENT.—The coal supply of the Far East at present is secured in a large measure from either India, Australia, or Japan, but there is prospect that within the next few years the competition in the coal markets will be much keener if the coal fields in

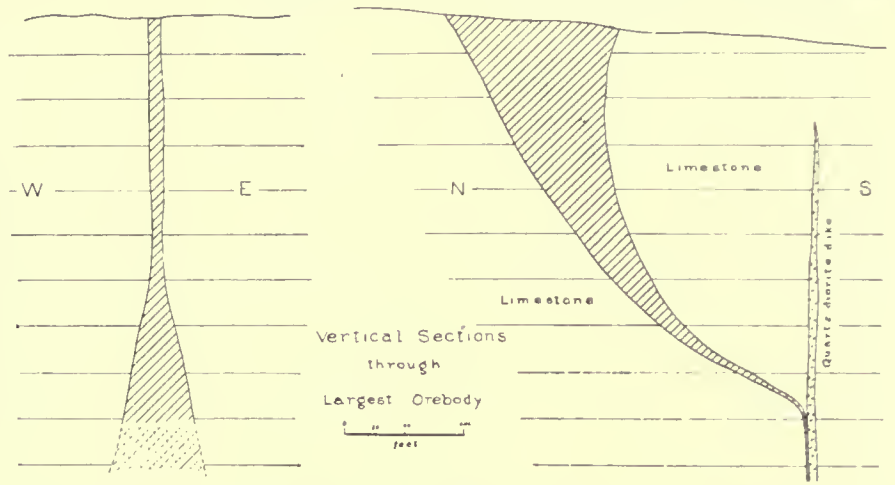


Fig. 2.

the Malay Peninsula, the Philippines, and China in any measure come up to expectations, and sufficient capital is made available for their development. In the Philippines the coal fields of Batan island on the east coast and the large area awaiting development in Cebu are attracting the attention of American capitalists and already the Philippine Government is considering the development of the Batan mines, while the railroad companies have been looking over the deposits with a view

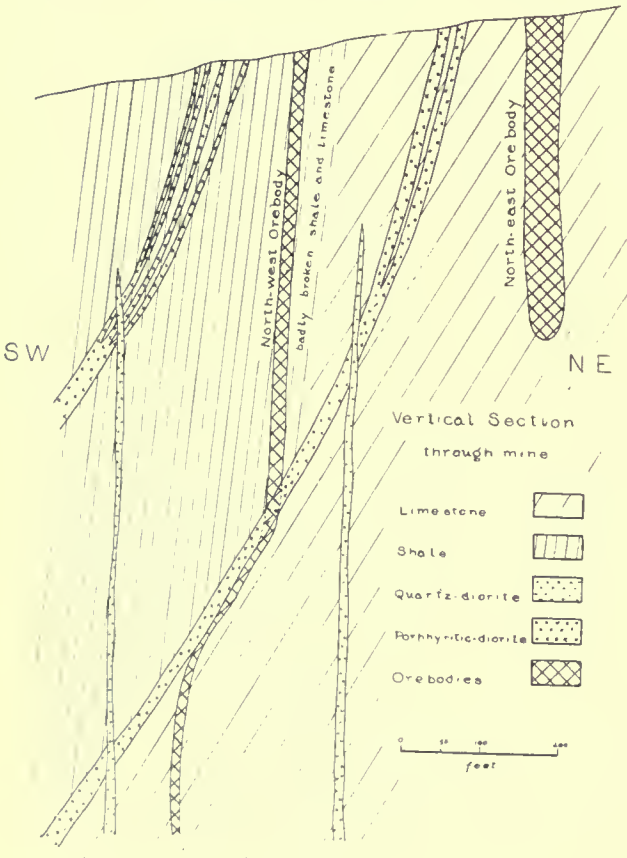


Fig. 3.

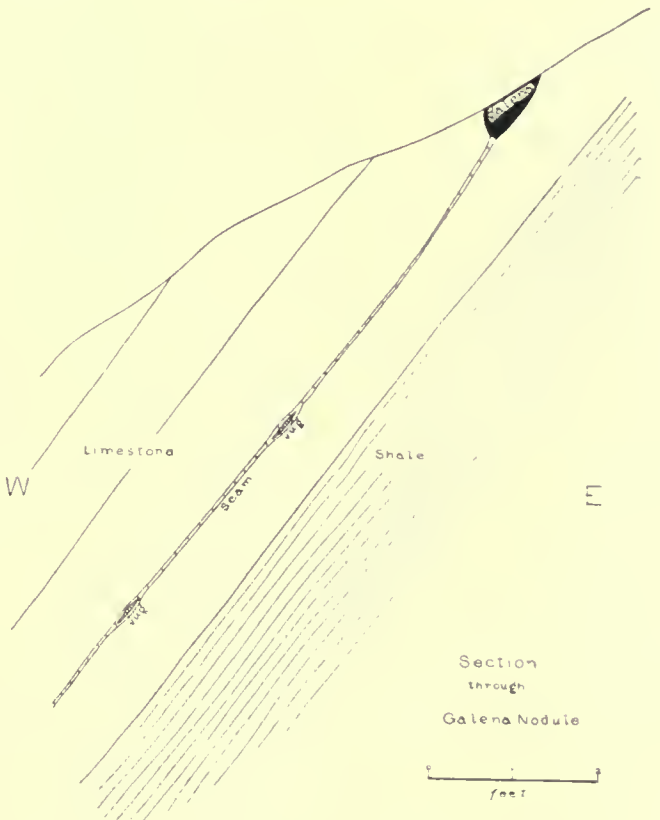


Fig. 4.

English name of this variety suggests that it is cast iron, it is not truly a variety of cast iron, but rather forms an independent species of iron, because it lacks the essential property of cast iron, which is its extreme brittleness. Though the term malleable castings is common, the term malleable cast iron is very rarely used.

to securing their coal supply in the islands. With what success these fields may be worked is a matter of some little conjecture. Reports of discoveries in Manchuria of coal deposits and the fact that engineers are going over all the ground carefully would indicate that there is prospect of unusual development during the next few years.

Concluding Notes on Guanajuato.

Written for the MINING AND SCIENTIFIC PRESS
By T. A. RICKARD.

At Guanajuato, it is estimated that it takes 2 to 2½ Mexicans to do the work of one capable white miner, but the native is paid one-fifth the wages given to the other. The Mexicans are undersized, they have the physical proportions of an American boy. In the mountainous regions, as in Durango, the men are bigger and stronger, and on contract work they can earn twice as much as the Guanajuatenses. Owing to *fiestas*, it is found that in employing a gang of *peones* on such work as excavation, it is necessary to carry 100 men on the payroll in order to have 30 always available, that is, they work one-third time.

In drilling a 'down' hole, there is no difference worth mentioning between white and native labor; the Mexicans strike the drill 100 times per minute, and their short rapid blows will equal in final effectiveness the long body swing and harder blow, made one-half as fast, of the European or American. The Mexicans work in less space. I have seen 18 men working in a shaft 7 by 15 ft.; there were nine pairs, one man holding the drill and the other striking, the change of one to the task of the other being made with the celerity characterizing a drilling contest. They carry water for the hole in their mouths and squirt it out as it is required.

Like the Turk, the native Mexican is a great porter. In carrying weights, the load is hung by a rope attached to a head-piece (*mecapal*), which is a nearly oval mat made of the *ixtle* fibre; it takes the shape of the forehead, and almost down to the eyes, lying over the front hair and under the hat. The *tenuteros*, or ore-bearers, can carry eight *arobas* or 200 lb. apiece; they will transport as much as that 100 ft. up the stone stairways of the old mines. At the Prospero mine, each man carries four tons per shift a vertical height of 75 ft., and a length of 400 ft., at a cost of 50 cents. At Guanajuato I saw some excavating for foundations done at 12 cents per cubic metre, the rock being carried a distance of 200 ft. across the gravel of a *barranca*.

They are good blacksmiths. At the Peregrina the native workmen took out the flues from a boiler that was in bad repair; they cut the tubes at both ends, and welded on an extra piece to make the original length. One smith and three helpers welded 24 tubes in 12 hours. The native blacksmiths are good drill-sharpeners, though better at shaping than at tempering.

Guanajuato had a flood, and like that of Noah it serves as a new starting point in local history; things happened B. F. or A. F. The catastrophe occurred on the first and second days of July, 1905, so that the recollections of it were still vivid at the time of my visit. Unusual tropical showers poured upon the neighboring country, and the waters converged from a steep watershed into a narrow ravine choked by bridges and crowded with dwellings. Never wide, the bed of the Guanajuato river had been elbowed by roads, houses, and debris, so that in places there was left a channel only two metres deep and four metres wide. Furthermore, it was extremely tortuous, the original course of the river having been repeatedly diverted to secure space for buildings. On the first day, the water rose to a level which just exceeded that of the flood of 1873—about four feet above the street. On the second day the volume of water was doubled, it rose 15 to 17 ft. above the pavement, and made terrific havoc among the soft masonry and mud walls of the old town, which melted like salt before the onrush. A few minutes sufficed to cause the collapse of many buildings, and to create fearful con-

fusion. At that time a sewer was being constructed at the upper end of the town, near the Presa, and the timbers of this were torn out, to be carried forward so as to form a battering ram, demolishing the *adobe* walls and choking the confined channel of the torrent. Officially it is stated that 54 were killed, but 73 were carried to the morgue, and it is probable that fully 100 people perished. Many Mexicans from the outside country happened to be visiting the town, it being the time of a *fiesta*, and of these a number were never accounted for. No Europeans or Americans were drowned.

At the time, there was nothing humorous about the disaster, but, with that happy instinct of humanity, as the horror was forgotten, some of the absurdities were remembered. To the natives it was an opportunity for spoil; looting was general. "*Es un regalito de Dios á*



After the Flood.

nosotros que no sabemos trabajar”—“it is a little gift from God to those of us who don't know how to work,” so they said to themselves. Some of the *peones* laid their hands on a shoe-store that had been devastated, and to this day they can be seen wearing a tan shoe on one foot and black leather on the other. The pink and green steamer-trunks of an American lady glorified the torrent for awhile, they bobbed under the arch of a picturesque bridge, and landed in the second story of a needy native. A mule was borne by the flood into another second story, and in his terror he bit into a box of ivory soap, and it was this that buoyed him across the waters. Billiard tables, with their slate tops cruelly exposed, were engulfed in the whirling debris. Seventeen pianos and two canons meandered down stream to the sound of many waters and their own spontaneous accompaniment. An azure splendor suffused the scene as a box of bluing from a laundry made its vivid passage, whereupon the pianos played a familiar waltz of Strauss. Bolts of silk

appeared among late mules and defunct pigs, street-cars were seen with men balancing on their unsteady decks until the upper windows of a church offered shelter. The Teatro de Juarez received a complement of burros, and the compliment of their lamentations, which simulated grand opera, just as the sequel imitated Noah's Ark, for when the waters subsided, they made their timid descent down the grand staircase with all the dignity befitting a momentous occasion. But worse things than these happened; a case of Saratoga whisky floated onto the desk of a total abstainer—and the owner of the whisky never saw it again.

With the downpour of rain came darkness, the natives lit candles, and the women came out on the balconies with lights, wherewith they made the sign of the cross, the church bells were rung, and to the natural horror of the scene was added a touch of solemnity. This was on the first day; when the second flood came in the late afternoon of the second day, with its repetition of an uncanny darkness, the people crowded to the adjoining hilltops, which were brilliantly illuminated with moving candles, while the air vibrated to ten thousand bells. To them it was the end of the world, and we, of San Francisco, who saw a greater devastation, can well imagine that to their simple minds it seemed a horror beyond explanation.

And so I come to the end of the notes that record my recent travels in Mexico. To speak in the language of photography: I brought some films from Mexico; most of them were only snapshots, there being no opportunity to get time exposures, therefore the images that I have delineated, and the impressions that I have tried to convey, may lack definition. But beyond the mental imprints that it has been my endeavor to transfer to the pages devoted to this account of a journey in the southern land, I brought other memories and experiences, which were never developed; they remain blurred, and to none but myself have they a meaning. I have recollections of multi-colored façades, of sunlit walls and cool *patios*, the sound of bells, and the crackling of whips, cries of *cerveza* and *frijoles*, conical hats and hooded women, a stream of chocolate colored humanity, a politeness that gave dignity to the commonplace, a squalor that soiled romance, and a sunshine that glorified everything; and then, like the refrain of a song that we love, the kindness of the men of my own race, and the hospitality of women who make every abiding place a home. And so, *Adios; vayan con Dios mis amigos.*

THE BOUNDARY BETWEEN STEEL AND IRON.—It would be well to decide on a definite carbon-content to serve as a boundary line between ingot iron and ingot steel, between puddled iron and puddled steel, and between any other varieties of wrought iron and weld steel. Two plans have been considered. One is to draw this line at 0.32% carbon or its equivalent in other elements, for the reason that this carbon-content appears to correspond to the critical point *O* in the diagrams of Roberts-Austen and Roozeboom. This has the merit of corresponding to a definite physical boundary. Mr. Pourcel would classify solely according to the presence or absence of slag, so that 'steel' should include all forms of iron freed from slag by fusion and cast in a malleable condition, and 'wrought iron' should include all classes produced in a pasty condition. He does not think that any cross classification according to the proportion of carbon is expedient. The other plan is to draw the boundary at 0.20% carbon, because this is a convenient place to separate the important classes 'soft steel' and 'half-hard steel' so that if this point were adopted

'ingot iron' would be synonymous with 'soft steel,' and 'ingot steel' would be the equivalent of the two classes 'half-hard steel' and 'hard steel.'

A New California Map.

A broad desert valley, through which a sluggish river flows, walled in on both sides by rugged mountain ranges whose peaks tower thousands of feet above, is the striking feature presented by the map of the Mount Whitney quadrangle just published by the United States Geological Survey. Few of the maps issued by the Survey can be examined with greater interest, since few areas within the United States comprise greater variations in topographic forms than the 960 square miles there delineated.

The Mount Whitney quadrangle is a part of east-central California and includes portions of Inyo, Tulare, and Fresno counties. It is crossed in a general south-east-northwest direction by Owens valley, with Owens river hugging the east side and discharging into its sink, Owens lake, in the south-eastern corner of the area.

On the east, Owens valley is bordered by the Inyo or White mountains, a typical desert range, with a number of peaks over 11,000 ft. high, with no perennial streams, and with few springs. These mountains, however, contain valuable mineral deposits, which are mined at a number of places.

Along the west side of the valley stretches the Sierra Nevada, presenting to the east an abrupt, almost precipitous wall rising from a height of about 4,000 ft. to over 14,000 ft. in a distance of less than five miles, and topped by the highest peaks in the main body of the United States. Mt. Whitney, named from J. D. Whitney, former State Geologist of California, rises 14,501 ft. above sea level, and closely rivaling it in height, Mt. Williamson attains 14,384 ft. Six other peaks in this region are over 14,000 ft. high, and there are many that fall just below that height. The numerous high peaks and glacial gorges and the thousands of little lakes that diversify the rugged west slope of the Sierra are famous summer camping grounds for Californians. Across the northwestern corner of the quadrangle winds the south fork of Kings river in a gorge 1,000 ft. deep, while in the southwestern part of the area Kern river traverses its wonderful canyon.

Owens valley is a barren desert except where reclaimed by waters entering it from the mountains, and Owens lake contains so much soda that its extraction has been found commercially profitable. The river itself for many miles above the lake is also saline, but the numerous streams that drain the west slope of the Sierra carry fresh water in abundance. The valley is traversed by the Nevada & California Railroad, a narrow-gauge line that will probably soon become part of a trunk line connecting the goldfields of Nevada with Los Angeles. Another connecting link with the city of Los Angeles will be formed by the pipe-line that, taking water from Owens river near its head, will pass along the west side of the valley, tap all the mountain streams that it crosses, and finally deliver its supply to the city. This gigantic enterprise will be accomplished at a cost of \$23,000,000.

The various natural and cultural features of the region are shown on the map with as much fidelity to detail as the scale, one inch to two miles, permits. Valleys and peaks, lakes and rivers, settlements and isolated houses, roads and trails are accurately recorded, and there is even marked, on the southeastern corner of the sheet, the fault-line resulting from the great earthquake of 1872.

The Dome of Equilibrium and the Caving System of Mining.

Written for the MINING AND SCIENTIFIC PRESS
By CLAUDE T. RICE.

The basis of successful underground mining is a thorough knowledge of how to open up the orebody. To acquire that knowledge, one must have a fairly good conception of how different ores and rocks are affected, when stopes or openings are made in them. And yet in regard to this very little has been written, in fact, practically no published data exist on the subject.

While much time is devoted by mining engineers to studying the geology of different districts and mines, they appear too busy to devote much study to the principles underlying this abstruse, but important, subject of how to support underground openings. The mining geologist aspires to understanding finally the how, whence, and wherefore of ore deposition from the study of nature's past. While volumes are written on such matters, the vital and ever-present problem of how to keep the stopes open, while getting the ore out, is conspicuously avoided in mining periodicals, so that we have made but little advance since Philip Deidesheimer invented the square set.

The mining engineer in general pays no attention to the problem of supporting mine openings. He depends upon the foreman for this, as well as for most of the other fundamentals of getting out the ore; and as for the foreman—well, he has acquired his knowledge by years spent in the stopes. Generally his knowledge is in many respects so nearly instinctive that he is unable to impart it to others. As a result of this ignorance on the part of the mine superintendent and the inability of the foreman to transmit his experience, although mining has advanced much in many directions, in this particular one it is still in much the same position that it was forty years ago.

At first the way to mine was to employ plenty of timber. Then, as the indiscriminate use of timber began to deforest the eastern part of this country, the mining men of the Lake region, under the spur of the ever increasing price of timber and the fact of the steadily decreasing value of their ore, faced the problem. Instead of spending money upon timbers, they decided to let the ore cave, and thus was evolved the admirable caving systems, so characteristic of certain of the iron ranges. But the Western engineer, owing mainly to the value of his ore, is, in general, unable to use a caving system. In consequence, the problem of keeping his stopes open gains in importance as with the diminution in the supply of timber.

At first all the members of the square sets were sawed timbers, and the posts were of ordinary length. As economy became necessary, the first step was to increase the length of the post, but owing to the inconveniences attending the use of posts of excessive length, the limit of saving in this direction was soon reached. As another step in economy, mines situated near a timber-supply substituted round timbers for the sawed, these being framed similarly to the square ones. Finally D. W. Brunton, realizing how much of the strength of round timbers was lost by such framing, devised his system of bevel framing for the round timbers composing the square sets, and the end of the road is approached in that direction of saving.

Other engineers, notably those of Utah, with mines situated far from a timber supply, stuck to the square timbers, but made a saving by varying the size of the different members of the square set, until the girts, posts, and caps are not of the same cross-sectional dimen-

sions. Thus we see that all are realizing the increasing importance of the problem. They are all trying to save; they save as much in the timber bill as they dare. But still it is the same old rule of guess that dictates the size of timber put in the stope. We have advanced from the days of the Comstock, when metallurgy was so much in the hands of the slick 'process-man,' purely by trying to find the why and wherefore of things. Yet in regard to the mechanics of underground stoping we are as much in the dark as formerly; cannot this be remedied?

This subject of the mechanics of underground stopes can hardly be studied as a problem in pure mathematics, but it is to be approached by an inductive attitude. At present few engineers would care to predict definitely—or even approximately—the shape that the roof of a stope, so many feet long and so many feet wide, would have in a certain kind of rock. Yet nature solves this problem every day. Geology, chemistry, and physics have accomplished much by the patient study of nature's own way of solving her problems. Cannot the mining man also hope to accomplish something by similar patient study in the direction indicated? Paradoxical as it may seem, we can learn most about this subject in those mines where the stopes are not supported, that is, where the caving system is used.

As is well known, untimbered stopes cave until they assume a self-supporting arch or dome-like shape. This 'dome of equilibrium' is not reached immediately, but is approached by a series of alternate falls of rock, first in the centre (the key of the arch), and then on the sides. The roof of the stope remains firm as long as the load upon it is due to that stope alone. But, as other stopes are opened near-by, the forces acting upon the roof become more complex. No longer is it the simple scaling or caving stage, but, owing to the changed nature of the forces, the movement becomes more block-like and the subsidence assumes the character of a fault. Instead of the steady load of the rock's weight, which alone is acting in the case of the simple stope, there are sudden stresses, due to the caving of other stopes, thrown upon the roof. These sudden stresses do not give the roof time to adjust itself by caving until a new dome of equilibrium is assumed, but instead the strength of the rock is suddenly exceeded, and new slips and joints are formed irrespective of those previously existing. The movement has reached the faulting stage.

This last dislocation is the one that sends its effects even to surface. It is this final stage of movement that causes the subsidence at surface characteristic of certain mining districts. Because of the thickly populated condition of some of the mining districts in their country, the colliery engineers of England, France, and Germany have made careful study of this faulting stage, and several articles upon it have been contributed to the mining societies of Europe.

Many writers have assumed that a stope will cave until it fills itself, but to me this view, except in the case of 'running ground,' seems hardly tenable, for, in what few caved stopes I have subsequently entered, I have always found an open space between the arched roof and the pile of caved rock. In general such a large stope-opening is necessary before caving commences; the self-supporting dome is assumed before the stope fills itself. The caving action is progressive, and as the slabs accumulate in the stope, they so support the sides that caving ceases. Finally, owing to the weakening of other stopes, the faulting stage is reached; not until then does the opening become completely filled.

In supporting the roof of a stope, only that portion of the roof that is below the line of the dome of equilibrium

requires support; the rock above this dome sustains itself. If, therefore, the shape of this dome of equilibrium in each kind of rock were known, it would be easy to calculate the weight of rock hanging below the dome, and so timber the slope as to hold up this weight. I am under the impression that the shape of this dome is fairly constant in each kind of rock; especially in the same rock in the same district. Of course, slips and joints, sudden changes in chemical composition, the dip of the strata in sediments, and many other facts, would affect the shape of the dome, but as long as these were small their effect would also be small. If investigation of the shape of this dome should suggest any formula to determine the strength of timber necessary to support the ground below the dome, the effect of these joints, etc., could easily be included by the factor of safety used.

Possibly I have allowed my enthusiasm to get the better of myself in this matter, but I hope not. I firmly believe that if mining men will only enter upon a study of the shape of the dome that caved workings assume in different rocks; if they will only plot the general shape of this dome and note the effect of slips, etc., on its shape, as shown by comparison of sections taken in different directions through the dome, together with whatever other phenomena that appear important; if then they would contribute these notes to some mining periodical, such as the *PRESS*, I believe that sufficient data would in time be accumulated to determine approximately the shape of dome to be expected in different rocks.

The possibility of placing the subject of supporting underground stopes on some approach to a scientific basis would seem to warrant a trying out of the above suggestions. Haphazard methods, such as have prevailed before, have led to little advance in the knowledge of this subject. Is it not a matter of sufficient importance to deserve a systematic study? Little can be accomplished by one person, but if a general interest is aroused much can be hoped for. Again I wish to suggest that the desired data are most readily obtainable at mines using the caving system.

In another article I hope to show what an effect the idea of this dome of equilibrium may have upon such a standard method as that of mining with square sets.

THE advance of prices abroad of articles imported into the United States, recently noted by the Bureau of Statistics of the Department of Commerce and Labor, seems to have occurred largely in manufacturers' materials, and, in a more limited way, in manufactures, while foodstuffs show little advance and in some cases a decline. The advances in prices shown in these principal articles imported, comparing average prices in the 10 months ending with April, 1907, with those of the corresponding months of 1897, are as follows: Pig tin, an advance of 207%; copper in pigs, bars, ingots, etc., 127%; unmanufactured fibres, 117%; iron ore, 108%; shellac, 107%; raw cotton, 69%; lumber, 64%; hides and skins, 63%; india rubber, 59%; raw silk, 57%; wood pulp, 56%; wool, 32%; nitrate of soda, 31%; and pig iron, 22 per cent.

CHINA'S COPPER SUPPLY.—The Chinese Government realizes the great demand for copper that exists by the provincial mints for the manufacture of bronze coins of different denominations, and that, up to the present, China depends upon foreign supply. It has therefore been decided to appoint a special high commissioner who is to reside in Yunnan, the great copper-producing province, and who will also have jurisdiction over the mines of Kiangsi, Kuangsi, Hunan, and Hupeh.

The Prospector.

Enquiries sent to this department are answered free of charge, if submitted by subscribers who are not in arrears. The full name and post-office address of the sender must be given, otherwise no answer will be made. Those who are not subscribers must accompany their questions with a fee of \$3 for each question. No assays are made.

The green mineral sent from Temecula, Cal., by C. L. B., is Malachite.

The mineral marked W. L. P., Ketchikan, Alaska, is Calcite.

A fragment of Hornblende was sent from Glendale, Ariz., by V. E. M.

A specimen of Quartz carrying sulphides was sent from Metcalf, Ariz., by W. P. L.

D. H. C., of Guadalajara, Mexico, sent a fragment of Specularite. It is a valuable ore of iron if found in sufficient quantity.

The specimens marked R. H., West Jordan, Utah, are: No. 1, Cuprite, Malachite, and Chrysocolla; No. 2, Pyrite and Chalcopryite.

The four specimens of rock sent from Lucin, Utah, by A. E. P., are: No. 2, black Slate; No. 3, Calcite and Limonite; No. 4, Mica Schist; No. 5, indurated Sandstone.

The Mexican burro is an animal which, in spite of its lowly condition and almost poetical patience, has played an important roll in the commercial life of Mexico as one of the means of transportation of merchandise. The traffic between railroad stations and interior points must still be handled by burro transportation. While the ox cart is in use in many parts of the country, the burro is much the swifter carrier, and is also an important factor in the mining industry, chiefly as an ore carrier. In the cities he serves in a variety of capacities. An animal of average weight, 500 lb., will carry in the neighborhood of 220 lb. and travel an average distance of 36 miles per day. Very few burros are sold in the City of Mexico, the principal market being in the States of Guerrero, Hidalgo, Puebla, and Oaxaca. Prices vary from \$12.50 to \$17.50 United States currency, and in the City of Mexico a burro trained to certain work will bring an average price of about \$20. The burro is raised almost solely for home use, there being very few exported, and these going to the United States and Cuba.

THE commercial utilization of various grades of oil as fuel for generating power, regardless of whether under steam boilers or in internal-combustion engines, will be easier, so far as technical difficulties are concerned, the better it can be ignited and the more efficiently it can be burned. Thus gasoline is a fuel of the greatest possibilities for automobile purposes. It is obvious, however, that in addition to the above other considerations are to be made when deciding the question of applying a certain fuel to certain uses, such as price, danger of explosion in handling, respective heat value, and, before all, heat density, that is, the quantity of heat contained in the unit of volume.

RUSSIAN GOVERNMENT MINES.—According to statistics of the treasury department in the Russian Empire, 15,072 oz. of gold was produced in 1906 in the Tomsk mining district, against 16,236 oz. in 1905. The Siberian steppe mining district produced 12,981 oz., against 9,852 oz. in 1905.

The Electrical Smelting of Iron Ore.

Written for the MINING AND SCIENTIFIC PRESS
By R. L. PHELPS.

It was only a short time ago that the first smelter for the electrical reduction of iron ore by the Héroult process was erected at Sault Ste. Marie under the auspices of the Canadian Government. The success attendant on this experiment in the East suggested to H. H.

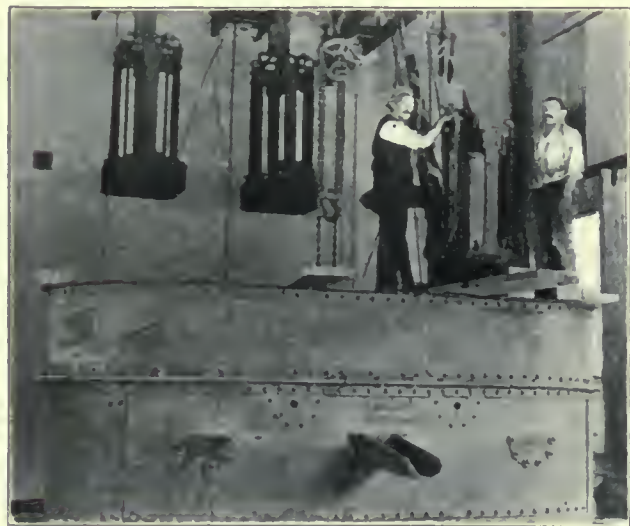


Fig. 1.—The Héroult Furnace, in Course of Construction. Charging Tubes Not Shown.

Noble, president of the Northern California Power Co., the possibilities of such a smelter for the reduction of iron ores found on the divide between the Pitt and McCloud rivers in Shasta county, California. The idea seemed feasible, particularly on account of the economic advantages offering themselves in this vicinity. Adequate electrical power could be obtained from the lines of the Northern California Power Co., running within a mile of the deposit, a plentiful supply of first-class limestone adjoined the iron ore, and unlimited timber was available for making charcoal. The chief uncertainty lay in the fact that at the Sault the smelter was operated with a single-phase alternating current, and in Shasta county the power available was three-phase 60-cycle alternating. The character of the current was

such that it was feared trouble might occur through short-circuiting between the three electrodes that would have to be employed in a three-phase system. As there had been no previous experiments with three-phase currents in a smelter of this design, the engineers naturally took special care to prevent any possible short-circuit. It was suggested that division walls might be constructed between the electrodes in the furnace, but these walls would reduce the capacity of the furnace. As stated, Mr. Noble decided to install a Héroult electric smelter to treat the Pitt river deposits, the experiment being

made entirely at his own personal expense. A suitable site was chosen on the Pitt river about six miles from its confluence with the Little Sacramento river, and about eight miles from the town of Kennett on the Southern Pacific railroad. Since construction began on the smelter the broad-gauge railroad of the Sacramento Valley & Eastern has been commenced from the Bully Hill copper smelter to the Southern Pacific railroad. This railroad passes the Héroult smelter so as to afford an outlet for the product, as well as convenient transportation of supplies to the smelter. Arrangements were made with C. B. Morgan, of the Shasta Iron Co., for a supply of ore from the Pitt river mine. This ore is magnetite; an analysis of about 400 tons at the smelter gave the following results: Fe, 70.2; SiO_2 , 2.4; insoluble, 2.8; S, 0.012; P, 0.01%. It is interesting to note the small percentage of sulphur occurring in the magnetite as compared with the heavy sulphide copper ores of the Iron Mtn. and Mammoth mines only a few miles away. The deposit of magnetite occurs as a big mass, 100 to 250 ft. wide, following the contact between diorite and limestone; it is seen on both sides of a steep ridge and has evidently been exposed by erosion.

The method of mining is by quarrying from the side of the deposit facing the McCloud river. The face of ore now exposed is about 250 ft. high. A quantity of ore has been brought by wagon from the mine to the smelter, a distance by road of three miles; later, a surface trolley tramway 5,000 ft. long will be constructed around the side of the mountain to a point on the ridge directly behind the smelter, the ore being taken thence to the smelter itself by an aerial tramway 3,000 ft. long, as is indicated by a dark line on the photograph of the smelter site shown in Fig. 2.

The erection of the smelter and necessary buildings has been superintended by N. Petinot, an experienced



Fig. 2.—Electrical Smelting Plant on the Pitt River.

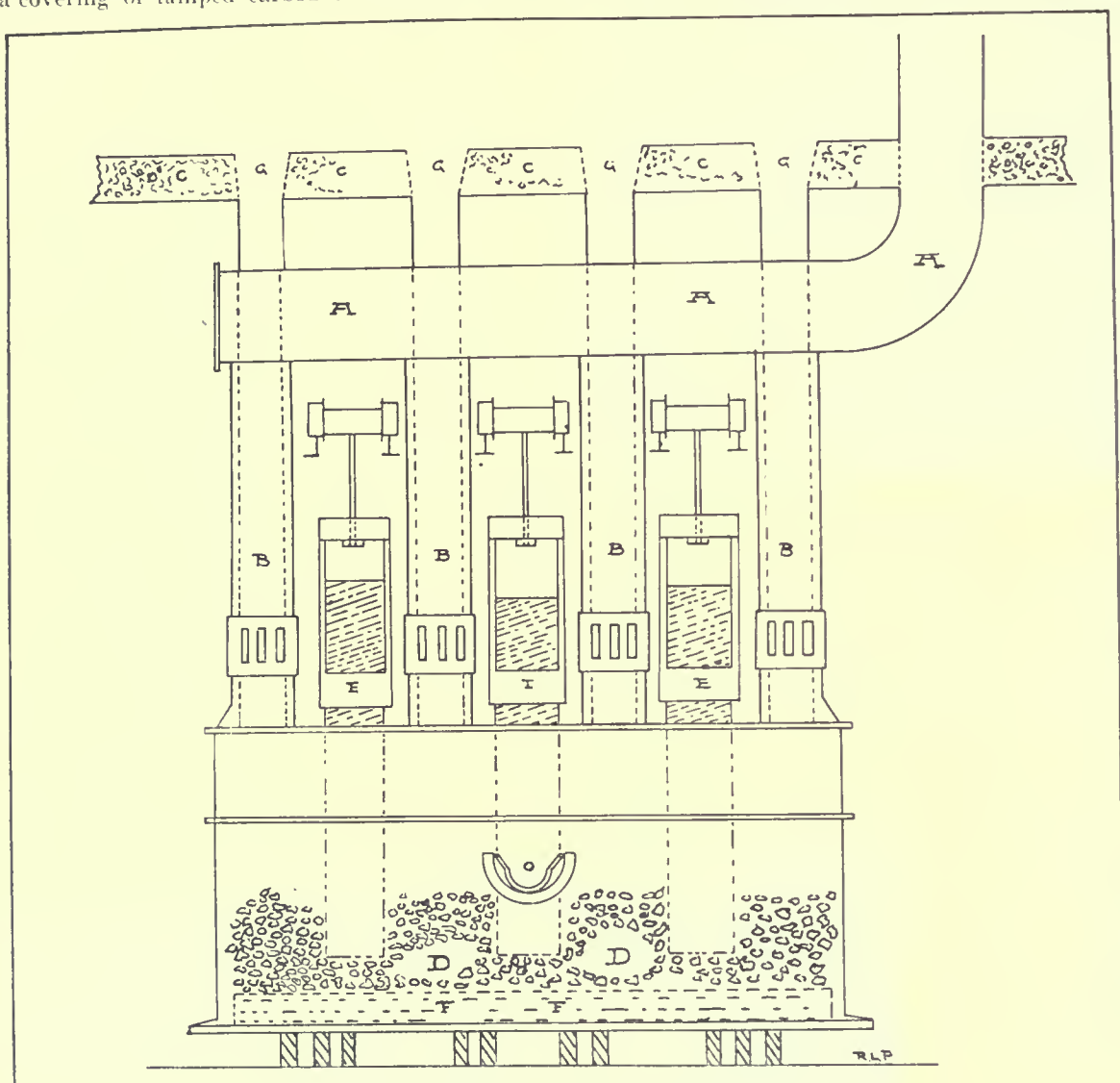
mechanical engineer. Paul Héroult, the inventor of the method of electrical smelting, has arrived to witness the experiment. He is accompanied by Robert Turnbull and E. Humbert.

The smelter is housed in a concrete and structural steel building covered with corrugated iron to insure strength and protection from fire. The sketch of the floor plan of the smelter will give an idea of the arrangement of the water-cooled step-down transformers that deliver to the electrodes 30,000 amperes at 50 volts 60 cycles from the 22,000-volt potential of the power trans-

mission line. Connection from the transformers to the electrodes is made by copper and aluminum buss bars through apertures in the concrete partition wall separating the transformer-room from the furnace and flexible bare copper cables lead the current from these terminals to the water-jacketed electrode-holders.

The smelter itself is elliptical in form with one compartment standing about 5 ft. high, made of heavy sheet steel, and lined inside with the best magnesite brick. The bottom of the furnace is formed of heavy cast-iron plates with a covering of tamped carbon to form the neutral

the top cover of the furnace, as shown in the drawing. These tubes consist of an inner tube made of steel and an outer tube made of cast iron so as to leave an annular space large enough to serve as a conduit for the gases that are generated. Bunsen burner slots are provided in the base of each outer tube to allow enough oxygen to enter, in order to complete the combustion of the gases liberated from the charge. The burning of these gases in the annular space heats the charge as it is fed through the inner tube to the furnace, thus delivering the charge hot instead of cold. The inner tubes pass to the



Sectional Elevation of Electrical Furnace.

- A. Chamber leading gases from furnace to stack.
B. Combination charge and draught tubes.
C. Concrete charging floor.
D. Charge in furnace.

- E. Holders containing electrodes.
F. Tamped carbon covering bottom of furnace.
G. Charge-tube manholes.

point of the circuit. The bottom plates are insulated from the upper parts of the furnace with asbestos. A tap and trough are provided on one side to draw the molten pig iron onto the molding beds. (See Fig. 1.) Owing to the small amount of slag produced in this furnace it is not necessary to provide a tap for removal of the slag. Any slag produced from the charge is exceptionally beneficial in this process as it offers an efficient resistance medium. The practice is to keep the electrodes in the slag rather than in the molten metal, the result being a better quality of product. Through apertures in the top cover, the three carbon electrodes are introduced; these carbons are 18 by 18 by 72 in. and were made in Sweden. They are fastened by wedges to a copper holder, which is water-jacketed, and by mechanical means these are lowered and raised from the furnace when necessary. Four combination charging and draft tubes are placed on

charging floor above the smelter. The gases are drawn through a chamber under this floor to the stack and the inner charging tubes are continued through the floor.

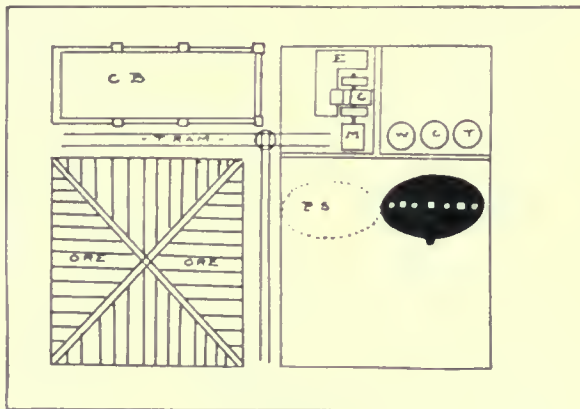
The charge is made of charcoal, limestone, and ore. The charcoal is burned in kilns close to the plant. The heat for smelting the ore is obtained from the resistance of the slag and charge to the current as it passes from the electrodes to the neutral point; consequently at the start the electrodes are in slight contact with the neutral bottom of the furnace. As the charge becomes heated the electrodes are drawn out of the molten iron and remain in the slag and charge.

Water for cooling the water-jacketed transformers and electrode-holders is furnished by an 8-h.p. centrifugal pump.

The current was turned on for the first time on June 29 to dry the lining and test the electrodes. At this trial

American carbons were used, but they cracked under only partial current pressure, and Swedish carbons were thereupon substituted. At the time the failure of the first lot, obtained from Cleveland, was imputed to their exposure to rain, but on inquiry it has been ascertained that the Swedish carbons were several months older and had been exposed to the weather fully as much.

On the evening of July 3 the current was again turned on and the furnace warmed up for the formal start on the morrow. About 10 o'clock on July 4, the furnace being sufficiently heated, a charge was added and the real experiment began. The daughter of Mr. H. H. Noble had the honor of feeding the first shovel-full of ore. With a low steady hum of the current the smelter ran successfully for 3½ hours, reducing the charge until molten iron collected in the bottom. This proved that the furnace could be operated by a three-phase 60-cycle alternating current. At the end of 3½ hours difficulty was found



Plan of Plant.

- W. C. T. Water-cooled transformers.
- E. Charge and ore elevator.
- C. Crusher.
- C. B. Charge-bin.
- P. S. Proposed additional furnace.
- M. Direct-connected motor.

with the centrifugal pump, which refused to deliver enough water to keep cool the transformers and electrodeholders. Fearing a possible rupture of the entire electrical system through the overheating of the transformers, it was decided to shut down the furnace until provision could be made for better service from the centrifugal pump. The furnace had been run long enough to prove that it was perfectly possible to operate successfully on a three-phase system, and also that enough pig-iron had been smelted to prove the feasibility of the electrical reduction of the Pitt river magnetite.

It was afterward found that the difficulty with the centrifugal pump was due to its position, requiring a long suction-pipe sunk in a riffle in the river. It was suggested that the air in the riffle-water, with the help of the long suction-pipe, probably caused the difficulty. A site for the pump at the river bank has been selected, and the suction-pipe will be sunk in still water. Preparations were being made to operate the smelter again on July 9 to reduce the 100 tons of ore ready for the furnace.

THE process of making cast iron depends much upon the kind of fuel used. Charcoal, coke, bituminous, and anthracite coal are all used, and the quality of pig metal is influenced to a great extent by the kinds of fuel, as well as by the temperature of the blast, with which the ore is reduced. When anthracite coal is used the ore is placed at once in the blast-furnace. When charcoal is used, the ore is first roasted by distributing it in alternate layers with waste coal, wood, or sometimes with charcoal, and the pile thus formed is ignited and burned in the open air. For more refractory ores a kiln similar to that used for burning lime is required.

Alaska Coal Fields.

Of the 600,000 square miles forming the Territory of Alaska, it is estimated that 12,644 square miles are underlain by coal-bearing rocks—that is, rocks that probably contain coal seams—and that 1,238 square miles contain workable coal, ranging in age from Carboniferous to Tertiary and in composition from anthracite of good quality through high-grade semi-bituminous steam and coking coals and ordinary bituminous coal to lignites of various characters. Many of the known coal deposits are of great thickness, especially where the coal carries a large carbon content; but unfortunately, high grade of coal and great thickness of beds are as a rule accompanied by geologic structure unfavorable to mining.

From the Pacific Coast to Bering Sea and the Arctic slope, through the valleys of Copper and Yukon rivers and their tributaries, coal beds are widely distributed; and although it is unlikely that any except the high-grade coals of the Pacific Coast and the Matanuska and Bering river fields are suitable for shipment far from the mines, many others may be locally of extreme importance and great value.

The coal-mining industry of Alaska is still practically undeveloped, the total production for 1906—the year of greatest output—being 6,660 short tons, valued at \$20,000. The most active mining operations have been on Cook Inlet, in southwestern Alaska, on the Yukon, in Seward Peninsula, and at Cape Lisburne, all undertaken to provide coal for local use, by small coastwise or river steamers, at mining camps and at canneries.

Alaskan coals have in recent years been the subject of a large amount of special investigation by the Geological Survey, and in addition much information concerning coal has been gathered each year since regular geologic work has begun in Alaska, by Survey parties working primarily on other problems. A brief summary of the results of these investigations, illustrated by a map showing the distribution and area of coal and coal-bearing rocks, is included in the Report on Progress of Investigations of Mineral Resources of Alaska in 1906, published by the Survey as Bulletin No. 311.

THE recent advance in Europe of the Thury direct-current system of power transmission demonstrates the fact that unless an alternating-current system approaching it in simplicity of design and economy of material is developed, it is only a question of time before the high-tension direct current will gain a footing upon this continent. Consequently, a high-tension one-phase system having several features not in common with either the direct-current or the three-phase system has been proposed. While the present three-phase system is more flexible than the direct current, it is more complicated, and requires greater outlay for transmission material. The ordinary one-phase system is simpler than either of these two, but requires 25% more copper than the three-phase system and a proportionately greater amount than direct current. Then again, considering the strain upon the insulators as a standard of comparison, the fundamental difference between the direct and alternating-current systems gives the former an advantage that no alternating-current system can overcome.

CORROSION or the wasting away of the iron of a steam boiler may be due to acid in the feed-water. Where sulphuric acid is found in this water its destructive force is often spent in destroying the feed-pipes before it actually enters the boiler. This is expensive, annoying, and even dangerous in some cases, but is much preferable to a boiler explosion.

Notes on Smoke Suits.

Written for the MINING AND SCIENTIFIC PRESS
By an Occasional Contributor.

Within the last few years many of the smelters in the United States have been harassed by suits for damage and injunctions to restrain them from discharging into the atmosphere sulphur and arsenic fumes. In these suits the demand for the injunction to restrain is the *grand coup de canon*. A judgment for damages, if assessed by a court, would, relatively to the importance of the smelting interest, be of trifling moment. The injunction to restrain is, because of there being no practical means known to science for the condensation of the sulphur fumes, of very serious moment, and would, if issued, mean the closing of the smelter.

The damage caused by the sulphur fumes whether slight or serious is, if any, obvious to all observers by its effect on vegetation and is readily capable of proof. Sulphur fumes damage only vegetation. The damage from arsenic and lead is less obvious to the eye. Vegetation is not affected, but herbage on which smelter flue-dust containing arsenic and lead or the condensed vapor of arsenious acid have settled, is cumulatively poisonous to stock. That damage has been caused to stock by metallic poison is less obvious to the eye than that of the damage by sulphur acids to vegetation. It would have to be proved by analysis of certain organs of the dead animals and other evidence. It is possible to diminish (by condensation, cooling, and filtering) the metallic poisons, but it is not practicable to remove the sulphur dioxide, which is not condensable by the foregoing mechanical means.

Cases of damage by smelter fumes vary therefore from the extreme of all sulphur and no metallic poison when the loss is vegetable, to those of little sulphur and much metallic poison when the vegetation flourishes, but the stock feeding upon it is more or less affected.

The party bringing suit against smelters for damage says, like Mr. Dooley: "I don't care who makes the laws, so long as I can make the injunctions." "Injunction or your purse" is the opening of the campaign. Many weak people might be disposed to take an opportunist course and settle for a sum stiff in itself but totally insignificant compared with the loss that would result from a cessation of the smelter operation. The majority knows that such a settlement with a spy would only be to invite attack from the following battalions, so they defend the suit.

Under the old common law there is no defence to a suit for proved nuisance. It must be stopped and an injunction must issue, no matter what may be the consequences to the defendant, or how insignificant the injury. In these days there are many public enterprises and others of public importance that necessarily cause some nuisance or annoyance and the principle of the great benefit has therefore been invoked and very generally admitted.

A railway passing by a stable may by vibration and other nuisance cause nervous prostration to a cow therein. The owner of the cow may demand the cessation of the nuisance and technically relief must be granted to him. But since the damage to the public generally would be enormous by stopping the operation of the railroad, and as the value of the cow is small and can be compensated for the grounds set up by its owner, that the damage is "irreparable" would not be nowadays admitted and he would be given compensation and told to hold his peace.

Smelting is a lawful industry and therefore entitled to the protection of the courts of law, but like similar industries, it must be carried on in suitable localities. There

is no excuse for a glue works planting itself on Fifth avenue, New York, and such works would be quickly enjoined. In cities there are generally districts where such industries can be carried on and the nuisance depends very much upon its situation.

Thus there are two big principles invoked by those defending smoke suits. The greatest benefit to the greatest number, and the choice of a suitable site for the smelter. It is doubtful if today any court would grant an injunction without weighing these two considerations in defence.

We have seen that recently in Utah the court would not admit that the locality chosen by the smelters there was one suitable for such industry. The principle of the greater benefit appears generally admitted. Therefore there are judges who adhere strictly to the maxim "*Sic utere tuo ut alienum non laedas*," but the Supreme Court of the United States has upheld the principle that an injunction to restrain an act, the consequences of which are trifling, will not issue. It must, of course, be shown in defence that the defendant is employing every reasonable and effective precaution known to science to prevent the nuisance complained of—and each case will have to depend upon its merits. We have seen that.

An industry causing more or less annoyance to neighboring proprietors may be maintained in some places and not in others. That is "the suitability of location." That where the injury complained of is not irreparable but readily compensated with money and is relatively insignificant an injunction may be refused. This principle has not been universally accepted.

It is unfortunate that in some cases where one locality chosen for the industry has been the most suitable that could be found, and where the damage was trifling that there has been litigation that has seriously interfered with the smelter industries without corresponding benefit to its neighbors.

It is to be hoped that out of so much litigation there will result some definite establishment of legal principles. If the old-fashioned principle, having still its adherents, that an injunction must issue, no matter what may be the consequences to the smelter or how insignificant may be the damage, should be upheld in the case of the United States *v.* the Mountain Copper Co. by the Supreme Court of the United States, smelting will become a lost art and other methods of reducing ores will have to be employed.

In stating that it is not 'practicable' to condense the sulphur acids, I do not mean that it is not physically possible. It could be done physically, but not commercially. It is therefore impracticable and cannot be done industrially.

The damage done to vegetation by sulphur acids is a question of degree. A few tons of oxidized sulphur discharged into the atmosphere would hardly be perceptible outside the limits of the works. That from a few hundred tons per day would be observed some miles away, and according to the manner of its discharge. If discharged low on the ground its effect is strong in the immediate vicinity. It is broken up by the surface and is quicker diluted, and not felt at much distance. If discharged high up in the air from a stack it may not affect the immediate vicinity at all, but travels much farther and in regular air currents, it is slower in becoming mixed and diluted, and may drop with damaging intensity at a considerable distance from the works. It seems to be more potent in damp than in dry weather. It cannot be condensed by practicable means because sulphur dioxide is not condensable at ordinary pressure and temperature and requires an enormous volume of water

for its collection in solution and this water evolves it on exposure.

In England, chemical works are restricted to a specified intensity, but not quantity. Thus the number of grains per cubic foot of gas escaping is specified, but no limit is put by law on the quantity. Of course, if the quantity were such as to do damage there would be still responsibility though the legal limit had not been passed.

The advantage of this is that as far as Government inspectors are concerned the proprietors know their position relative to the authorities, just as does a motorist; but if the latter, while driving at less than the legal limit, should carelessly or willfully cause damage, he would be responsible for his act.

It would seem that as regards damage at a distance it is better to discharge the smoke in regular quantity low down on the ground from several points. The annoyance locally would be extreme, but that at a distance would be minimized. Discharging at a height, if the smoke contains much sulphur, is apt to cause damage at a distance. The damage from arsenic and lead is often fatal to stock. The fine flue-dust and fume collect on grass on the side facing the smelter and adhere to it. Animals fed on such grass are sometimes poisoned. Such flue-dust can be arrested in the smelter by condensation and filtration.

Notes on the Fundicion Smelter.

This smelter is being erected by the Douglas Copper Co. at Fundicion, 153 kilometres from Guaymas. The plant is situated on the east side of the Cocoraqui drainage. A well has been put down on the side of the creek to a depth of 100 ft., and has already encountered an abundant supply of good water. The smelter will be of 600 tons capacity, and is to be, in its design, one of the most modern in all Mexico. The power-plant will consist of Morrison suspension fire-box boilers, each boiler having a capacity of 150 h.p., and built to work under a steam pressure of 150 lb. per sq. in. The blower-engines are tandem-compound, built by the Bates Machine Co., and directly connected to 150-cu. ft. Roots high-pressure smelter-blowers. The generators, two in number, were built by the Western Electric Co., and are directly connected to vertical cross-compound Bates engines. The current will be direct and of two voltages, 110 volts for lighting purposes and sundry other uses, and 500 volts for power-transmission. Engines will be run condensing. All the machinery throughout the plant, including the pumps, will be motor-driven. The furnaces were built by the Power & Mining Machinery Co., and are 44 by 160 in. with 14-ft. charge column. The settlers are of 15 ft. diam. by 5 ft. deep. The furnace connections to the stack are by means of 6-ft. steel down-takes into an 11-ft. balloon-shaped steel dust-chamber, connecting with the stack base. The stack proper is a self-supporting steel structure, having a lower diameter of 12 ft., and an upper diameter of 8 ft. The total height of the stack will be 177 ft. above the ground-line.

Material will be delivered to the charge-floor by means of Jeffrey steel-pan roller-bearing elevators, each having a capacity of 25 tons per hour. The material will be run into the elevator-boots in divisional charge-cars, which provide for the delivery of the material in proper proportions. The discharge from these elevators will be into steel bins placed one at each end of each furnace, from which the charge will be run into the furnace direct. The mixing of the charge will be secured through its dumping into the elevator-boots, its passage up the elevators, its dumping into the bins of the furnaces, and

from there into the furnaces. So far as it is known this is the first instance of this arrangement in connection with a smelting plant, and it is believed that it will effect a more thorough mixing of the charge than any arrangement in use elsewhere.

The sampling of the ores will be done mechanically. One-tenth of the total tonnage will be cut out mechanically by means of a Vezin automatic sampler mounted on trucks. These samplers will have a capacity of 30 tons per hour. This one-tenth, which will be the sample proper, will be sent in a narrow-gauge car to the sampling works, where it will pass successively through the crushers, rolls, and samplers. These last machines will cut out two equal portions of one-hundredth each, and these two portions will pass through the finishing department of the sampling works as independent samples, and from there go to the laboratory. This practice will give a thorough check both on the sampler and on the laboratory work, and will make difficult either an attempt at a fraud or an undiscovered inaccuracy.

The service of the plant throughout will be by means of a 36-in. gauge railway; all material will be moved by locomotives, including the slag and matte. The matte ladles will have a capacity each of ten tons, and will be mounted on 36-in. gauge trucks. The converter-building will be 200 ft. from the furnace-building. This arrangement will make the working conditions for the men in both of these departments far better than they would be if both departments were combined.

The principal source of ore for this plant will be the properties of the Douglas Copper Co., all of which are in the district of Alamos, the El Cobre mines being the best known. The company has been developing that property for the past four years. The development work has been extended to a depth of 900 ft., and to a length along the vein of half a mile. The engineers of the company have estimated that there is ore in reserve on that one property sufficient to keep the plant in operation for five years.

By September the company will be in the market for the purchase of ores carrying gold, silver, and copper. The magnitude and the mechanical equipment of the plant will be such as to enable the shipper to accompany his carload of ore to the smelter, see it sampled, and get his results in from one to three days. This advantage to the shipper will be apparent when it is borne in mind that sometimes there is a lapse of from four to six months in securing settlements on ores shipped from the West Coast to smelters in the United States, and to the interior of Mexico.

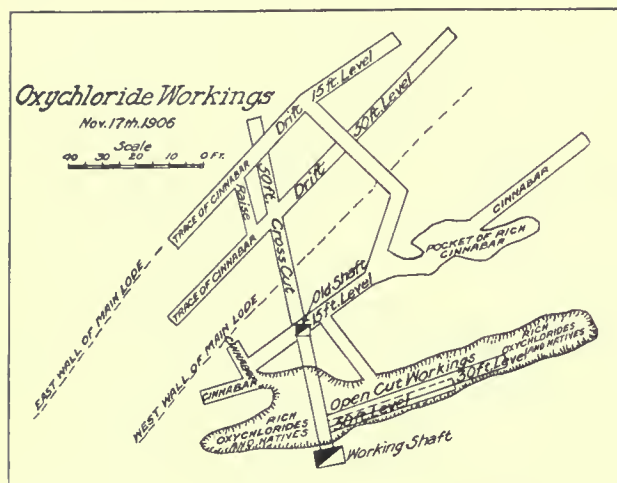
YUKON ENTERPRISE.—An important work contemplated in the near future is the construction of a large power-house of approximately 1,000 h. p. near the western boundary, on the Yukon river, some 50 miles below Dawson, for the purpose of furnishing electrical power to dredges on the Fortymile creek and its tributaries in Alaska and the Fortymile and Klondike rivers in Yukon Territory. The company has a power-house in Dawson and furnishes this city and Grand Forks with electric light, and Dawson with water for household purposes and a hydrant system for fire purposes. The fuel used in their present plant is coal taken from the company's mine on Coal creek, at which place the proposed plant is to be situated, the idea being that it is cheaper to convey electricity than coal. The output of the mine last year amounted to some 8,000 tons, the entire output being used by the company in Dawson. This coal landed at Dawson by the company's steamer costs about \$12 per ton. With the plant at the mouth of the mine the coal costs about \$2 per ton.

Rare Mercury Ores.

Written for the MINING AND SCIENTIFIC PRESS
By CLIFFORD G. DENNIS.

At Terlingua, in Brewster county, Texas, there is an interesting deposit containing oxychlorides of mercury. The ore carries terlinguaite, eglestonite, montroydite, and calomel in a blanket formation between layers of limestone. There is, however, a fine fracture, now filled with calcite, that seems to have afforded a passage between the layers of limestone.

The first discovery of this prospect was a thread of calcite in the hard limestone. Upon following this veinlet down a few feet, eighteen to twenty inches of earthy



Plan of the Mine.

formation was encountered; this was very rich in terlinguaite. The layer of earthy material spread out over an area of about 15 by 100 ft., being cut off completely at each end and at the sides by hard massive limestone. Going down into the lime again a few inches, another stratum of ore was discovered of slightly smaller dimensions; this one and the many lower strata were not as thick as the upper one but there was alternate lime and ore until a depth of 20 ft. was reached, here a more massive limestone was encountered, which later development proved was the lower limit of the mineral-bearing earthy material.

In taking out these layers of earthy material, caves were often found in the lime with crystals completely coated by terlinguaite; some of the caves were half full of native mercury, while others were as full of calomel. The lining of these caves yielded beautiful specimens; in some fragments of cave-lining there were white crystals, the points of which were tipped with a coating of terlinguaite or eglestonite, while in the base of the crystals there occurred native quicksilver in an amalgamated mass that would flow but not disintegrate.

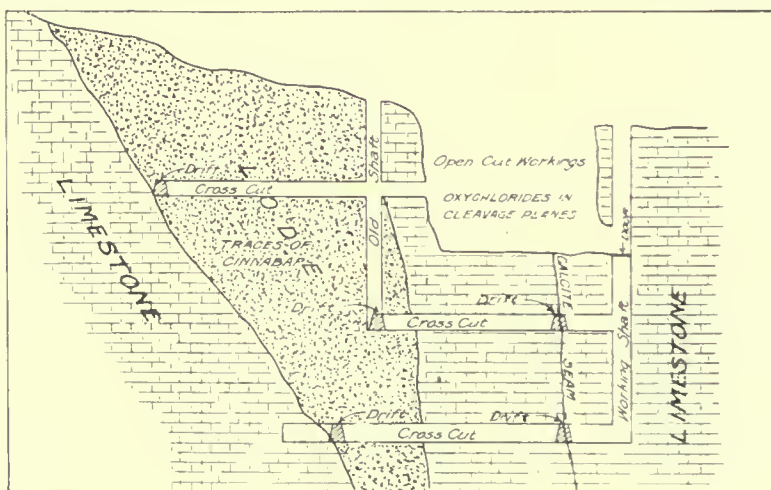
As mentioned, this deposit does not occur as a well defined vein but (as seen by the accompanying sketches) it lies adjacent to an extremely strong lode that is traceable for long distances on either side of the deposit. There seems to be no connection whatever between this lode and the oxychloride deposit although it probably received its enrichment from the lode by erosion and oxidation.

To facilitate mining, a shaft was put down on one side to a depth equal to that of the open-cut. This shaft was

subsequently continued to a depth of 50 ft., where cross-cutting and driving were started on the calcite vein of the oxychloride deposit and on the main lode. The drift at this level failed to find any oxychlorides, so another cross-cut and drift were run at a point 15 ft. higher and above a layer of very hard limestone that the shaft had penetrated. In this upper drift some native mercury was taken out but not much of anything else. Evidently this hard layer of lime prevented the solutions from penetrating below, for even the calcite vein was much weaker below this point and sometimes the fracture was barren even of calcite.

Strange to say, development in the lower workings on the main lode failed to discover anything more than traces of ore, in the form of cinnabar; not a trace of oxychlorides was ever found in the main lode.

MINERAL RESOURCES OF THE PHILIPPINES.—The minerals of the Philippines are coal, iron, gold, and copper. Since the American occupation, American miners and prospectors have been busy and more has been learned of the mineral resources of the islands than in the whole previous course of its history. Important deposits of coal have been found at Batan, and asbestos at Ilocos Norte, while gold, silver, and copper have been found in paying quantities. The native workings of some of the mines run back to a remote period, but were primitive in operation. At Batan bituminous coal has been discovered in quantities and of excellent quality. Analysis shows it to be superior to Pacific and Alaskan coal, and equal to Japanese and Australian coal. Tests made on Government transports show it to be slightly inferior to Japanese coal as regards steaming radius, ton for ton, but superior in every other quality of a steam coal. It contains little ash and little sulphur, both of which are present to a much greater extent in Japanese coal. Iron is plentiful. In Bulacan province there are mountains mainly composed of iron, assaying up to 63% and over. Gold is found all over the islands, but as yet in no large amounts. American miners are, however, prospecting the country in their search for the precious metal, and it is believed there are possibilities in this line. Copper is



Cross-Section of the Deposit.

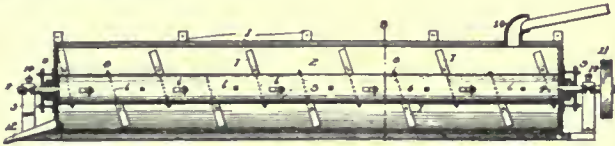
found in large deposits, but lack of transportation facilities has prevented much development.

An estimate of the value of the exports from the United States of iron and steel for the fiscal year ending June 30, 1907, places them at \$175,000,000. As showing the rapid growth of the iron and steel works it may be stated that the exports in 1887 were only \$16,000,000 and in 1897, \$57,000,000.

MINING AND METALLURGICAL PATENTS.

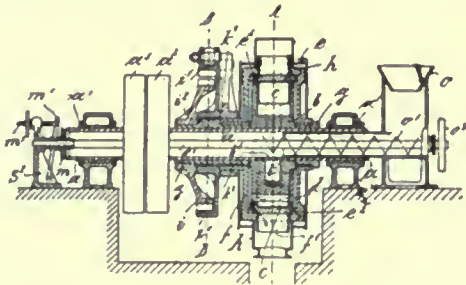
Specially Reported for the MINING AND SCIENTIFIC PRESS.

MEANS FOR SEPARATING OR CLASSIFYING ORES.—No. 856,612; Herbert E. Wetherbee, Cleveland, Ohio, assignor of six-twentieths to William Rattle, one-eighth to James F. Leitch, and seven-fortieths to Cyrus W. Merrell, Cleveland, Ohio.



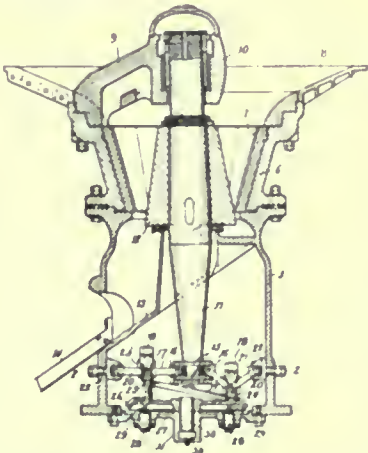
In means for separating ores, the combination of a stationary receptacle provided with openings for the ingress and egress of liquid; a positively-driven rotary member in said receptacle which is separated from the receptacle's walls by an annular space forming a sorting column, said rotary member being adapted to impart a rotary motion to the receptacle's contents and to receive and project the ores to be separated into said sorting column intermediate of the top and bottom of the latter; and a source of liquid supply adapted to furnish a stream of liquid flowing upwardly through said sorting column from such ingress opening.

ROLLER MILL.—No. 855,602; Jullus Wüstenhofer, Dortmund, Germany.



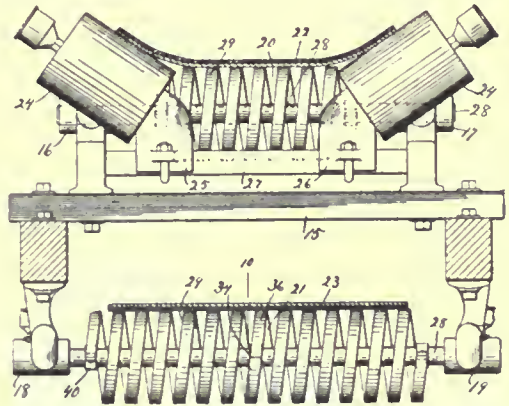
A roller mill comprising in combination, a driver provided with chambers, a plurality of rollers, in each of said chambers being mounted several rollers, a grinding mantle having a grinding surface, a casing to which said grinding mantle is fixed, floats secured to said casing, means for rotating said casing and grinding mantle, a hollow shaft carrying said driver, a hollow shaft coaxially arranged with said first shaft and supporting said casing, an outer case inclosing said casing and means for feeding the articles to be ground.

ROCK-CRUSHER.—No. 857,940; Edward A. Hoff, Milwaukee, Wisconsin.



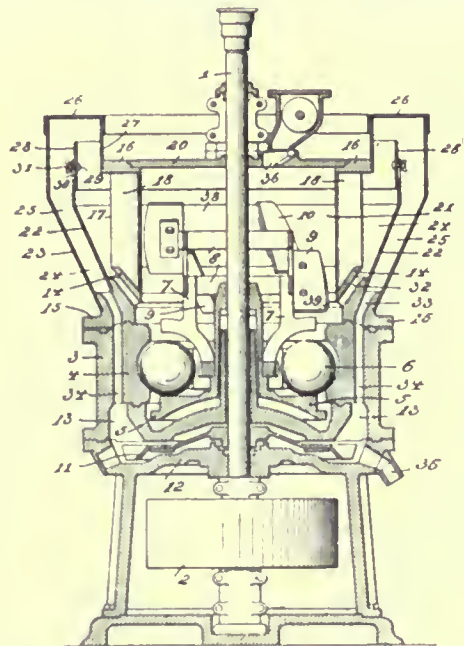
Means for producing a gyratory motion, comprising a pivotally mounted shaft, a series of toggles connected with the shaft, a stationary support to which the toggles are connected, and means for moving the toggles successively for causing them to exert pressure upon the shaft in different directions.

CARRYING-ROLL FOR BELT CONVEYERS ETC.—No. 857,610; Raymond W. Dull, Aurora, Ill., assignor to Stephens-Adamson Mfg. Co., a Corporation of Illinois.



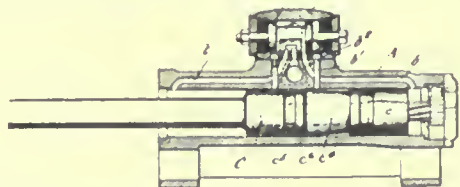
A carrying-roll for belt conveyers comprising, in combination, an arbor, and a bar bent to helical form spaced apart from the arbor and forming the periphery of the roll, the ends of the bar being inturned and secured to the arbor.

PULVERIZING OR GRINDING MILL.—No. 857,932; James W. Fuller, Jr. Catasauqua, Pennsylvania.



In a pulverizing or grinding mill, outer and inner casings, rotatable blades or wings arranged centrally in the mill within a casing arranged inside of said inner casing and forming by the operation of said blades or wings the suction chamber of the mill and said outer and inner casings forming separating and collecting chambers, said inner casing provided with a ring adjustably supported therefrom and adapted to increase or decrease the outflow of material from said separating into said collecting chamber.

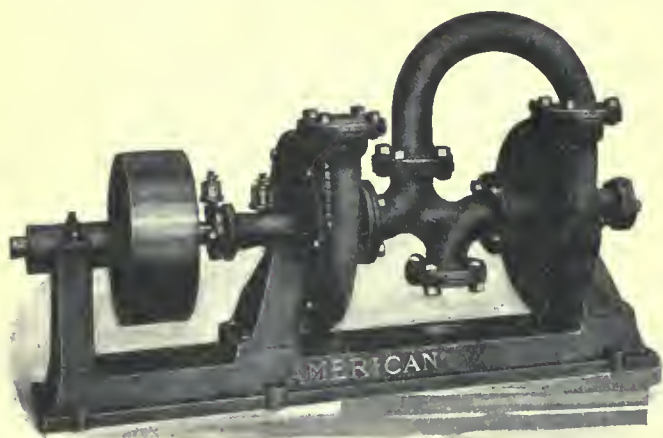
ROCK-DRILL.—No. 858,195; John B. Marshall, Broken Hill, New South Wales, Australia.



In a rock-drill having a valve, a piston having an annular recess for controlling the operation of the valve, said recess comprising spaced annular grooves and a tapered portion connecting the grooves, whereby to operate said valve with a gradually increasing velocity on the outward stroke of the piston.

Centrifugal Pumps.

The increasing demand for a centrifugal pump of high mechanical efficiency, at a moderate price, has led The American Well Works, of Aurora, Illinois, to specialize in the manufacture of this kind of machinery. It is common practice with many manufacturers of pumps to advertise a certain efficiency as being guaranteed to users of their machines. As a matter of fact there is a vast difference between mere efficiency, and mechanical efficiency. The former means nothing, as it does not take into consideration power consumed, while the latter term means what per cent the water horse-power (power represented in work



done) bears to the applied horse-power. The 'American' pumps are built with especial attention to a high mechanical efficiency, and the manufacturers claim 60 to 68% mechanical efficiency, at the economical capacity, on the No. 5 and smaller sizes, and 70 to 80% on No. 6 and larger; and a mechanical efficiency at 66% under or over-load, of 35 to 59% on No. 5 and smaller, and 50 to 60% on No. 6 and larger sizes. These results are without parallel in centrifugal pump history, and they mean that American pumps use power nearly in proportion to the work done, which is certainly an important consideration. These pumps were designed to elevate water up to 65 ft., but the company builds single pumps of special design to elevate 125 ft., or multi-stage pumps for lifts up to 250 ft. The illustration shows Type I, a high-pressure, two-stage, belt-driven, designed for heads of 250 ft. or less.

The American Well Works is building pumps especially adapted to meet various demands. For irrigation work, for handling liquids containing solids in suspension, for cofferdam and excavating work, for dredging, for fire protection, for water-works, all these requirements are being studied and met by this company, and on all products turned out, a mechanical efficiency of 25 to 33% greater than that of any other pump manufactured, is claimed.

Trade Treatises.

THE WESTINGHOUSE ELECTRIC & MFG. Co. issue a reprint of an excellent article by Charles V. Allen on 'Electric Machinery for the Operation of Mexican Mines.'

THE THEW AUTOMATIC SHOVEL CO., of Lorain, Ohio, has issued Catalogue No. 6, on 'Steam Shovels.' The pamphlet illustrates and describes shovels, excavators, and dredges, for mines, smelters, blast-furnaces, ore-docks, and various uses.

THE INGERSOLL-RAND CO., New York, issues a handsomely illustrated bulletin on Crown pneumatic hammers. Every detail of construction is shown and every operation described. The design of this hammer is new and the construction simple. It is claimed to strike a harder quicker blow than any other, with 20 to 30% less air and with slight cost for repairs. Made in five sizes for chipping, calking, sealing, flue-heading, etc., and in four sizes, long stroke, for driving rivets from the smallest up to 1½-in. diameter.

Books Received.

'West Australian Metallurgical Practice.' This is a reprint of valuable articles appearing in the monthly journal of the Chamber of Mines of Western Australia. The book contains details of practice and other information of undoubted value to those engaged in cyaniding gold ores. The price is 21 shillings, and the cost in America allowing for custom dues and expressage, will be \$7.

'Hydrometallurgy of Silver.' By Ottokar Hofmann. This book deals with a special subject and it has been prepared by a specialist. The chloridizing roast of silver ores and the extraction of the metal with sodium hyposulphite is a process not so common as it was twenty years ago, but it is still important. The book also deals with the Augustin, the Ziervogel, and the cyanide processes as applied to silver ores. It is well illustrated. 340 pages. Price \$4. For sale by the MINING AND SCIENTIFIC PRESS.

'Water-Works Management and Maintenance,' by Winfred D. Hubbard and Wynkoop Kiersted. This is a valuable work, containing 420 pages and many illustrations. The book is divided into three parts, dealing with the methods and principles of developing, improving, and storing water-supplies; maintenance and operation; and the questions of franchises, water rates, and depreciation resulting from deterioration of physical property. Published by John Wiley & Sons, New York. Price \$4.

'The Engineering Index Annual for 1906.' Size 9½ by 7 in.; pp. 416. Price \$2. This volume represents the continuation of the work originally started by the late J. B. Johnson in the Journal of the Association of Engineering Societies in 1884, and turned over by that association to *The Engineering Magazine* at the close of 1895. The previous volumes, published respectively in 1892, 1896, 1901, and 1906, covered with increasing care and thoroughness the field of technical engineering periodical literature, and in the present volume every care has been taken to maintain and advance the standard set by its predecessors.

'Tin Deposits of the World.' By Sydney Fawns. This is the second edition of a book published by *The Mining Journal*, London. It has been in demand, as affording a compendium of information on a subject, the interest of which has been heightened by a favorable metal market. The book gives an account of the deposits of tin ore in different parts of the world, a description of tin dressing, assaying, and smelting, together with statistics of production. As the only book on an important subject, this second edition is most welcome. It is neatly bound and printed, and contains a number of useful sketch maps and illustrations. Price, 15 shillings. For sale by the MINING AND SCIENTIFIC PRESS.

Commercial Paragraphs.

ANNOUNCEMENT is made by the WESTERN ENGINEERING & CONSTRUCTION Co., Monadnock Bdg., San Francisco, that the contract, which has existed practically seven years, with the Bucyrus Co. of South Milwaukee, Wis., expired July 1, 1907. This contract covered the sole agency for the sale of Bucyrus placer mining machinery and also an exclusive right for the construction of dredges carrying the Bucyrus Co.'s machinery. The company still represents the Robins Conveying Belt Co. The scope of their business is now enlarged so that they are in a position to act as consulting engineers, and are free to construct dredges for the recovery of gold, using not only the machinery of the Bucyrus Co., but also that of any other manufacturers that their clients may specify. They also handle other engineering installations, as the equipment of belt-conveyors and other labor-saving machinery. More attention is now being paid to engineering consultation work by a competent staff of engineers. The personnel of the Western Engineering & Construction Co. still remains the same: F. W. Griffin, pres.; D. P. Cameron, vice-pres.; M. E. Griffin, sec. and treasurer.

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TABLE OF CONTENTS

Editorial:	Page.
Notes.....	95
The Royal School of Mines.....	96
The Cost of Mining.....	96
By the Way.....	97
General Mining News.....	99
Special Correspondence.....	104
Butte, Montana.....	
Mexico City.....	
Pioche, Nevada.....	
Salt Lake, Utah.....	
Toronto, Canada.....	
Cripple Creek, Colorado.....	
Concentrates.....	110
Discussion:	
The Royal School of Mines...F. Lynwood Garrison	111
Cyanidation in the Transvaal.....G. A. Denny	111
Articles:	
Working Costs on the Rand and Comparisons With Mines in California.....Ross E. Browne	113
The Treadwell Group of Mines...Arthur C. Spencer	117
Ore Deposits in Serpentine.....William Forstner	121
Mineral Land—An Important Decision.....	123
An Improved Timber-Framing Machine.....	126
Mining and Metallurgical Patents.....	125
Decisions Relating to Mining.....	120
Departments:	
Personal.....	98
Market Reports.....	98
Obituary.....	98
Publications Received.....	126
Commercial Paragraphs.....	126

Editorial.

WE GIVE an excerpt from the bulletin entitled 'The Juneau Gold Belt, Alaska,' recently issued by the United States Geological Survey. This report by Mr. Arthur C. Spencer is a good example of the excellent work done by the Survey. As it includes a description of the Alaska-Treadwell mine, our readers will find it particularly interesting.

OUR CORRESPONDENT in Mexico refers to the construction of railways in the State of Sinaloa, from the interior plateau to the coast. The Stillwell railroad is progressing steadily. We are also glad to learn that an extension of the Western Railway of Mexico is to be made from Tepehuanes to Culiacan, tapping the Topia mining district. The consolidation of railroad companies under control of the Mexican Government ought to help the mineral development of the country. Certainly, the disorganization along the Mexican Central has been a serious handicap during the past twelve months, and it is much to be hoped that the shortage of cars will soon be at an end.

TO RIDE TWO HORSES is clever, and for that reason we are constrained to admire the agility of *The Mining Investor*, a Colorado Springs paper that attacks pernicious mining schemes, and yet advertises others that look just as bad. The editor deprecates the hypercritical attitude of the technical press, and champions the companies that sell shares in holes in the ground unlikely to become mines. In the last issue some judicious remarks are offered concerning fraudulent mining schemes, and on the same page there stares the reader in the face the offer of a "free trip" to Colorado "if you will get up a club of your friends to take 20,000 shares of the Wellington Development stock at 25c. a share." Does the *Mining Investor* consider this a likely method of making money? Does this look like legitimate mining? Is it business or bunkum? On other pages of the same paper we find offers of other stocks at so many cents per share, coupled with the weird descriptive matter and absurd statements that mark the very people whom the *Investor* attacks on occasion. This giving of advice to investors through the same medium that carries to them the lure of the faker has in it the elements of humor.

Since writing the above we have seen the *Mining Investor* of July 15, which devotes nearly three pages to a patronizing correction of our contemporary in New York. The editor of *The Engineering & Mining Journal* had commented upon the difficulty of educating the public to distinguish between bogus schemes and real mining enterprises. With the views expressed by him we concur. The editor of the New York journal does not need

our aid in defending himself in a pillow-fight with the gentleman at Colorado Springs. But we venture to say that if there is any one that makes it difficult to distinguish between the shadow and the substance, the wild-cat and the mine, the bunkum and the business, it is he of the *Investor*.

The Royal School of Mines.

ENGLISHMEN ought to read the letter from Mr. F. Lynwood Garrison in regard to the Royal School of Mines, because Mr. Garrison happens to be a graduate from the University of Pennsylvania who went to the Royal School of Mines subsequently. As a professional man who has tested the training obtained in his youth, Mr. Garrison is in a position to make useful comment. Evidently this American graduate thinks well of the school to which Huxley lent the lustre of his name and the stimulus of his personality. We confess to enjoying the tilt against the Imperial College with its endowment of red tape and high sounding names, and we appreciate the most un-royal treatment of a great scientific school, rendered truly Royal not by courtesy of the Crown so much as by the kingly men who were teachers of natural philosophy to the youth of England. Our friends of the Institution of Mining and Metallurgy have tried to do their best for the School of Mines and they have succeeded in rescuing it from extinction, but, in common with many others to whom the future of the School is a matter of keen interest, we feel that it is being emasculated by consolidation with such a nondescript university as that of London and with such hybrid kindergartens as the other training institutes at South Kensington. Great Britain controls 70 per cent of the gold production of the world and is directly interested in a mineral output of about \$1,000,000,000 per annum. Nevertheless, there is only one School of Mines of the first rank in the whole British Empire. By the "first rank" we mean an institution comparable with any one of half a dozen schools of mines in North America. We hold it a great misfortune that the great empire-builder, Cecil John Rhodes, was not persuaded to endow the School of Mines instead of Oxford; it would have been more practical and more to the point. For Oxford and the Oxford idea we have a profound reverence, but the sending of Colonials and Americans to "the home of lost causes" is already a magnificent failure. However, that is another story. The one thing beyond argument is the fact that the Royal School of Mines has received scant support from England and its people, until now young Englishmen cross the Atlantic to get the training that is to fit them to become mining engineers. They come so far from home as California. And we do not wonder at it. Dear old John Bull has gone to sleep. He finds the capital for the mines and is surprised if his sons are not as well prepared to manage them as his cousin's children. He thinks that names carrying luminous tails and impressive prefixes can make a Royal School of Mines and he thinks that he strengthens it by calling it an Imperial college—Imperial cheese!

The Cost of Mining.

ON another page we publish some interesting observations, made by Mr. Ross E. Browne, concerning the cost of mining on the Rand as compared with two well known mines in California. Mr. Browne has recently returned from an engagement as advisory engineer to Wernher, Beit & Co. in the Transvaal; so that he is possessed of the best available information on the subject. By a pleasant coincidence Mr. Browne's name is mentioned by our Johannesburg correspondent this week and also by the Secretary of the Interior in an important decision, in respect of the mineral character of land, as reported in this issue. This makes it timely to state that the next State Mineralogist of California will be Mr. Browne, on the resignation of Mr. Lewis E. Aubury, an event that has been expected for six months past and is assured at an early date.

In regard to the cost of mining on the Rand, it is obvious from the analysis presented that the decisive factor is the expense of labor. This is an item too often obscured by those who are enthusiastic over new processes and new machinery. The management of men remains the basic problem in the conduct of any industrial enterprise. While the recent strike at Johannesburg was regrettable, it has had an important result in opening the eyes of the managers of mines to the laxity of supervision and the wasteful methods permitted underground. Once more we see that economy in mining hinges mainly upon getting faithful service from the shift-boss. Those of us who have had charge of mines know how much depends upon the shift-boss. He stands between the technical man and the laborer, between the manager and the miners; he, like a boatswain on a ship or sergeant in a regiment, is in direct contact with the men "behind the gun;" upon his fidelity and sense depends much of the character of the work accomplished. A good shift-boss is worth a lot of money to a mining company. Directors are not likely to know this, nor anxious shareholders, for they come in contact only with the manager, accountant, engineer, and other men at surface. Fine machinery, systematic accounts, elaborate maps, and the like, will impress the non-technical man, who is quite unable to appreciate the relative importance of efficient work in the stope and drift. Mr. Browne makes comparisons likely to provoke keen dissatisfaction among investors in Katfir stocks, for he makes it clear that the cost on the Rand is excessive. Much of this is due to distance from manufacturing centres, the consequent high cost of machinery and supplies, and the big salaries needed to attract capable men so far from home; but this does not explain it all. Lack of economy in management is due largely to poor supervision, especially of the cheap colored labor by the high-priced white overseers. This is one of the penalties of employing the subject races. Europeans and Americans always tend to become lazy when they have coolies at their beck and call. That is the experience with *peones* in Mexico. It can only be overcome by obtaining the service of first-rate shift-bosses and of changing them whenever they become weakened by their environment.

By the Way.

In his presidential address before the Institution of Civil Engineers of Great Britain, Sir Alexander Kennedy said:

In relation to science, I have always claimed for engineers a very high place—a place much higher than some of my purely scientific friends are disposed to allow them. M. Jourdain talked prose all his life without knowing it. So I really believe not a few engineers have spent their whole lives in scientific work while they were nominally only earning their daily bread in ordinary mechanical pursuits. It is not, however, so much that engineering is science as that the scientific spirit is often the basis of engineering, and that when this is the case, engineering becomes as truly scientific as any other branch of exact research, and none the less scientific because it is also the means of making an honest living. Engineering problems differ from ordinary academically scientific problems, partly in that they are much more complex, and consequently more difficult of anything like exact solution, and still more because—exact or inexact—some solution to them has always got to be found.

It has been, no doubt, a source of regret to many who have passed this chair, as it is to myself, that, as years go on and experience accumulates, our work comes more and more to deal with men and matters, with general schemes and methods, even with financial means and possibilities, and less with the directly mechanical problems which fascinated us when we were younger, and for the sake of which, probably, we took to engineering in the first instance. This is one of the penalties of old age—of engineering old age, at all events—and it is no use lamenting it. But speaking of the constructive part of an engineer's work and life, the part on which some of us look back as the very essence and joy of our career, we can see that it consisted essentially of a long series of scientific problems to be dealt with, scientific questions to be answered. If the engineer has dealt with these by scientific methods and in a scientific spirit, if he has carefully marshaled his data, deliberately reasoned from them, recognized where they were incomplete, estimated the probable effect of their incompleteness upon his judgment and upon the result, and finally made his decision and taken his action on the whole matter as a logical conclusion from his previous reasoning, then, I say, the engineer is acting as truly as a man of science as if he were conducting a laboratory research with appliances and methods of exactness and precision unknown in actual professional problems. But a word of caution—unnecessary to the experienced, but sometimes necessary nearer the start. The mere use of formulae or of exact calculations of any sort is not in itself scientific. That man shows far more of the scientific spirit who recognizes when his data do not allow of the use of any exact formulae, and who therefore reasons with what may be called mathematical common sense, than the man who tries to force the facts to fit a class-room formula, and arrives at a result which satisfies the formula without recognizing that it bears no relation to the facts. The scientific engineer may use elaborate calculations, or he may not; a most important part of his science lies in judging whether to use them or not. Conversely, the man who calculates elaborately may be working scientifically, or he may not. The mere calculation is not scientific, and in certain cases may only be a cloak to essential defects both in scientific method and in technical perception.

To what extent do engineer and artist come in contact? It can hardly be denied that there are points which at least ought to be points of contact in their work, al-

though their paths seem frequently to intersect rather than to be tangential, and the intersection is too often at ninety degrees! When engineering structures were confined to masonry bridges and pumping stations the matter was comparatively simple. It was difficult to make a stone bridge which was structurally efficient and actually hideous at the same time, and many of the older structures of this type left nothing to be desired by way of beauty of line. Whether a castellated or a quasi-Gothic building was the most suitable form for a Cornish engine-house may be questioned, but at any rate many of the pumping houses which once covered the country were not eyesores, and along with a not unpleasing exterior they combined complete internal suitability. It seems a little odd to us now—but it was certainly prompted by worthy motives—that even the machinery inside the houses was designed on architectural lines which were at least supposed to be lines of beauty. Even in the time of my own apprenticeship, it was universal for bed-plates, entablatures, and other large castings to be finished at their corners and angles with moldings more or less carefully designed according to classical models. Even moving parts, such as the bosses of cranks, were ogeed round their edges, and no connecting rod of a stationary engine was considered finished without a double ogee ring round the middle of its length. Some of these details were survivals from cast-iron construction applied to a forgeable material, but they all died hard, like many less harmless customs. Penn's oscillating engines in the Thames steamers, which were at work until only a few years ago, had their cylinder-cover nuts of gun metal, each made with a turned ogee molding at their base like a fixed washer. And the entablatures of the same engines were wonderful in their wealth of detail. We expect architects to consult and employ engineers to help them over structural difficulties and we may even scold when they come to grief for not doing so. They are, on the other hand, quite entitled to turn the tables on us when they see that an engineer has put up a hideous barn which they could have transformed into a pleasing structure by their own special knowledge, and by that sense of form which it has been their chief business to cultivate, while we have been working at bending moments and breaking loads.

I have spoken of engineering in relation to art; it would perhaps be put down to cowardice if I did not say something of the relation of engineering to nature. Our interference with nature comes practically under two heads—the erection of works for the utilization of water, either for use in cities or for power, and the construction of railroads in mountainous or other beautiful districts. The first is the easier to deal with. The conversion of upland valley bottoms into lakes by the construction of dams seems to me to be out of court at once. I am not inclined to admit that to cover boggy peat land with blue water is doing any harm to nature, or that a fine masonry dam is an eyesore. Moreover, if it is required for the supply of water to cities which could not obtain the water otherwise, it is a "work of necessity and mercy," and there is no more to be said about it, unless the engineer is neglectful. Water storage for power purposes can hardly be put upon quite so high a level, and unfortunately such works are generally accompanied by pipe lines, which, it must be owned, are not things of beauty. But if the net result of the whole is to give employment to hundreds of men in places where hitherto no one could maintain himself, and to utilize natural sources of power hitherto neglected, for doing useful work on the spot where they exist, then I think an impartial arbitrator would say that the schemes were justified, even at the expense of ruling a straight line on the landscape.

Personal.

PHILIP ARGALL is at London.

W. H. ALDRIDGE is at Montreal.

GEORGE W. MAYNARD is at Seattle.

PERCY L. FEARN has returned to New York.

E. C. MILLER has left Ely to go to Hailey, Idaho.

A. W. WARWICK is at Choix, in Sinaloa, Mexico.

JAMES A. FORCE has an office at Tonopah, Nevada.

F. K. BOYD is with the Esperanza Mining Co. at El Oro, Mexico.

W. H. BLACKBURN is with the Tonopah Mining Co. in Nevada.

D. A. CONOLLY sailed from New York by the *Carmania* on July 16.

J. K. ROMIG is manager of the Virtue mine, near Baker City, Oregon.

LEWIS T. WRIGHT is spending a few days at the Iron Mountain mine, Keswick.

E. D. LIDSTONE is general manager for the South Fairview Mining Co. in Nevada.

J. POWER HUTCHINS has been examining mines near Hendersonville, in North Carolina.

E. P. MERRILL is managing director for the Real del Monte Co. at Pachuca, Mexico.

FREDERIC IRWIN is general manager for the Trade Dollar Con. Mining Co. at Dewey, Idaho.

GEORGE H. ENNIS, interested in gold dredging, is in San Francisco from Twin Falls, Idaho.

P. R. WHITMAN is with the Greene Gold Silver Co. at Temosachic, in Chihuahua, Mexico.

C. F. NURSE has accepted an appointment as mine manager in the Ural mountains, Russia.

FRANCIS A. THOMSON is on a tour through the mining districts of East and West Kootenay.

H. A. DENNY, until recently at Johannesburg, is visiting the mining districts of the Western States.

WALTER R. INGALLS, editor of *The Engineering & Mining Journal*, is expected here next week.

R. C. TROEGER is general manager for the Estelle Mining Co., at Cerro Gordo, Inyo county, California.

FRANK J. MURPHY, recently in Mexico, is now superintendent of the Yampa smelter, at Bingham, Utah.

C. W. DODGE, JR., is assistant engineer with the Valardena Mining & Smelting Co., in Durango, Mexico.

CHARLES W. ABBOTT, of Pioche, is assisting C. W. GEDDES in the examination of mines at Goldfield, Nevada.

WILLIAM RICHARDS of Redruth, England, passed through San Francisco on his way from Egypt to Vancouver.

S. A. WORCESTER has completed the installation of machinery at the Findley mine in the Cripple Creek district.

L. A. GREENE, representative of the MINING AND SCIENTIFIC PRESS at Chicago, is on a visit to San Francisco.

C. W. PURINGTON is at the mines of the Ochotsk Gold Mining Co. in Eastern Siberia. He will be there until October.

L. S. AUSTIN will visit the smelters in Utah during August.

THOMAS T. READ, professor of metallurgy in the Colorado College, is spending a month in the San Juan region of Colorado.

J. A. HOLMES, in charge of the Division of Technology for the United States Geological Survey, was in San Francisco this week.

F. W. BRADLEY has left on his periodical tour of inspection to the Bunker Hill & Sullivan mine in Idaho, and the Alaska-Treadwell mine on Douglas Island.

Latest Market Reports.

LOCAL METAL PRICES—July 25.

Antimony.....	17.00@20.00c	Quicksilver (flask).....	538@39.50
Copper.....	24.00@25.00c	Spelter.....	7.25@ 8.00c
Pig Lead.....	5.35@ 6.30c	Tin.....	43.25@44.75c

ANGLO-AMERICAN SHARES.

Cabled from London.

	July 18.	July 25.
	£ s. d.	£ s. d.
Camp Bird.....	1 0 7½	1 0 9
El Oro.....	1 8 9	1 8 9
Esperanza.....	2 7 0	2 3 9
Dolores.....	1 6 3	1 6 3
Oroville Dredging.....	0 17 0	0 16 6
Stratton's Independence.....	0 2 10	0 2 6
Tomboy.....	1 11 3	1 11 3

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.

Date	Electrolytic Copper	Lead	Spelter	Silver
July 19.....	.21	5¼	6.05	67¼
" 20.....	.21	5¼	6.05	68½
" 21.....	Sunday. No market.			
" 22.....	.21	5¼	6.05	69¼
" 23.....	.20¾	5¼	6.03	68¾
" 24.....	.20¾	5¼	6.03	
" 25.....	.20¾	5¼	6.03	68¾

SOUTHERN NEVADA STOCKS.

San Francisco, July 25.

Atlanta.....	8 62	Laguna.....	1.50
Belmont.....	3.30	Little Tonopah.....	2.50
Columbia Mtn.....	57	Manhattan Con.....	45
Combination Fraction.....	2.27	Midway.....	1.00
Daisy.....	2.05	Mizpah Extension.....	25
Fairview Eagle.....	70	Mohawk.....	17.00
Florence.....	5.45	Montana Tonopah.....	3.30
Gold Bar (Bullfrog).....	70	Nevada Hills.....	6.25
Gold Bar (Goldfield).....	56	Red Top.....	4.25
Goldfield Con.....	8.35	Sandstorm.....	43
Goldfield of Nevada.....	1.70	Silver Pick.....	62
Gold Kewanas.....	74	St. Ives.....	92
Great Bend.....	75	Tonopah Extension.....	1.50
Jim Butler.....	1.02½	Tonopah of Nevada.....	13.00
Jumbo.....	4.25	Tramp Con.....	45
Jumbo Extension.....	1.77½	West End.....	80

(By courtesy of W. C. Ralston, 368 Bush St.)

COPPER SHARES—BOSTON.

Closing prices.

Closing prices.

Name of company.	July 25.	Name of company.	July 25.
Adventure.....	2½	Michigan.....	14
Almeek.....	75	Mohawk.....	82¼
Allouez.....	45½	Nevada Con.....	14½
Amalgamated.....	137¼	North Butte.....	82½
Arcadian.....	6½	Old Dominion.....	43
Atlantic.....	12½	Osceola.....	127
Bakakala.....	9½	Parrot.....	19
Bingham Con.....	15	Pheulx.....	1½
Boston Con.....	27	Quincy.....	117
Butte Coalition.....	25¼	Raven.....	
Calumet & Arizona.....	166	Rhode Island.....	5½
Calumet & Hecla.....	7.8	Santa Fe.....	3¼
Centennial.....	29	Shannon.....	16¼
Con. Mercur.....	43	Superior & Pittsburg.....	164½
Copper Range.....	80¼	Tamarack.....	105
Daly-West.....	15¼	Trinity.....	22½
Franklin.....	14¼	United Copper com.....	61½
Granby.....	120	Utah Copper.....	45
Greene-Canaan, etc.....	157½	Victoria.....	7¼
Isle Royal.....	19¼	Winona.....	7½
Mass.....	5¼	Wolverine.....	161½

(By courtesy of E. F. Hutton & Co., 490 California St.)

MINING STOCK QUOTATIONS—NEW YORK.

Closing Prices

	July 18.	July 25.
Bingham Central.....	1½	1
Boston Copper.....	26¼	27½
Cumberland Ely.....	9	9
Dolores.....	6½	6
El Rayo.....	4½	4¼
Guanajuato Con.....	3½	3½
Giroux Con.....	8	8½
Greene Con.....	25	25
Nevada Con.....	14½	14½
Nipissing.....	10¼	10¼
Tennessee Copper.....	39¼	46
Tonopah Ex.....	15	15
Tonopah-Belmont.....	3½	3¼
Tonopah.....	11¼	13¼
United Copper.....	61½	62
Utah Copper.....	29	28½

(By courtesy of Hayden Stone & Co., 25 Broad St., New York.)

General Mining News.

ARIZONA.

YAVAPAI COUNTY.

(Special Correspondence).—The Unida Mining Co. has just installed a 25-hp. hoist at its mine in the Black Rock district. A vertical working shaft is being sunk to tap the vein at a depth of about 200 ft., from which point driving and cross-cutting will be commenced. The ore now being shipped is coming from a tunnel on the Blue Lead group of claims and is netting about \$60 per ton in gold, silver, and copper, the gold value being \$40 per ton. These claims, known as the Gray Eagle and Blue Nelly, are a part of the property of the Unida Mining Co. Two carloads of timber and lumber have just been received for building bunkhouses and timbering the shaft. Other properties that are making good headway in the Black Rock district are the King Solomon, Black Rock Ltd., and O'Brien. Good ore is being taken from the 160-ft. shaft of the Senator mine in the Big Bug district. The country rock is hard, but an air compressor is being installed and power-drills will be put in and the work pushed. Tunnel No. 2 is in 260 ft., with some ore all the way, while the last 20 ft. is in good ore, with considerable water coming in. A raise will soon be run to connect with tunnel No. 3, which is now in 420 ft., the first 200 ft. being in a badly broken formation that has only small bodies of ore. At the face of the tunnel a more permanent ore-body has been encountered. About 80 ft. ahead of this tunnel a shaft is being sunk from the surface toward the tunnel-level. This shaft is now down 45 ft. and is in ore of good grade. These workings will be connected as soon as possible. This shaft will not be sunk much farther, as a raise will be run to connect the lower tunnel with No. 2 tunnel and all the ore will be handled from the No. 1 tunnel, which starts at the millsite. A mill is contemplated and may be in operation by October 15. It will consist of a crusher and a battery of Nissen stamps, with a capacity of about 25 tons per day. There are hundreds of tons of concentrating ore on the dumps. The entire cost of shipping and smelting is about \$20 per ton.

Prescott, July 25.

CALIFORNIA.

AMADOR COUNTY.

About 1,500 ft. of development work has been done at the Burlington Gold M. Co.'s property, in the shape of shafts, tunnels, and drifts. The mine is equipped with a six-stamp mill of the individual quadruple discharge type. The company expects to be dropping 60 stamps within a year. The shaft is down 450 ft. and cross-cutting will start at the 500-ft. point. Several shareholders from Michigan and Chicago have recently visited the property.—Some large nuggets have been found at the Gold Top gravel mine at Pine Grove. The company, for which J. B. Batz is the superintendent, has built a restraining dam on the middle fork of Jackson creek.

CALAVERAS COUNTY.

It is reported that the Lightner mine in Angels will soon start on the open-shop principle. It is also unauthoritatively reported that the Utica may start up again on this same basis.

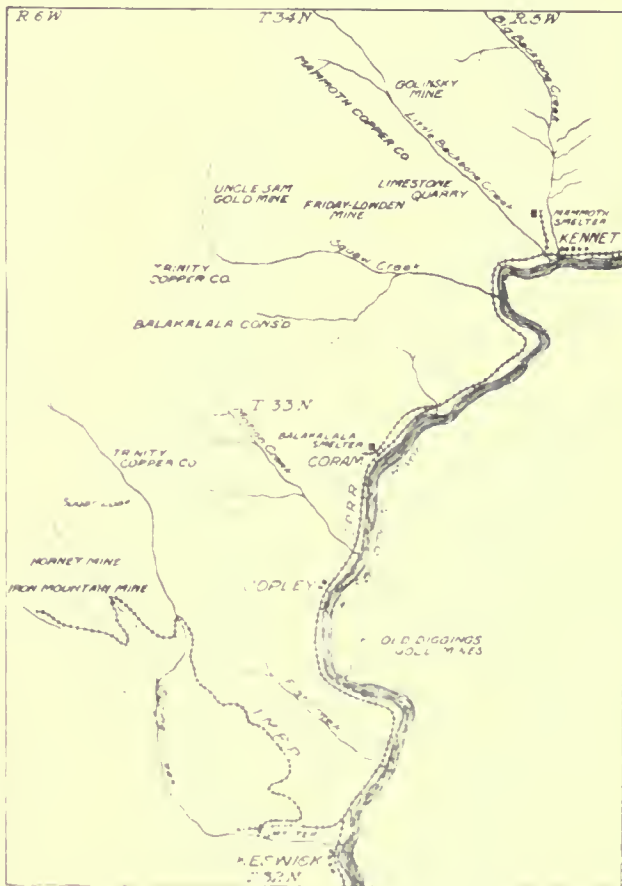
PLACER COUNTY.

The new electric hoisting plant at the Crater has been completed and is running.—Stoping is being done on the 1,100 and 1,200-ft. levels of the Three Star mine and 37 men are employed.—Good ore is being hoisted through the new vertical shaft of the Bellevue mine.—Victor Henderson is taking out good pay-dirt from the Stemple tailing claim in Shirt Tail canyon.—Ed. Witherspoon is opening up the Yankee placer mine, at the mouth of Sailor canyon, on the north fork of the American river.—The new heavy machinery for the Herman mine is being hauled from Colfax. The 12-stamp mill will have 30 stamps added to it. The stoping is at present confined to the upper level, 250 ft. below the surface, and the south drift is being run in the lower tunnel. Dams for power to run the electric gener-

ators will be built on the middle fork of the American river.

SHASTA COUNTY.

Three 50-ton steel ore-cars have arrived at Coram for the Balaklala Copper Co., to be used in hauling ore to the smelter. Four carloads of machinery and a quantity of coke have just been delivered.—A deal for the sale of the Golden Calf mine on Flat creek is being negotiated by Luke and Thomas P. Mitchell. A 615-ft. tunnel has been run on the claim and some ore has been shipped to the smelter that ran \$27 per ton in gold.—J. B. Keating states that cars will be running to Delamar by November 1, over the Sacramento Valley & Eastern railroad that is being built by the Bully Hill Copper M. & S. Co. Two locomotives and adequate rolling-stock have been ordered. The narrow-gauge railroad between the smelter and the No. 3 entrance to the mine, will be made standard-gauge, making the entire road



Map of the Copper Region in Shasta County, California.

18 miles long.—The claims of the Shasta King property are to be prospected by a diamond-drill in charge of D. Longton.—The new hoist for the Shasta King mine is being hauled on wagons to the property.—The Monette brothers have an option on the Brockett mine of the Lower Springs district.—An electric hoist is being erected on the Milton claim, adjoining the White Oak. H. O. Cummins is the manager.—A compressor-plant is to be erected on the Sugar Loaf group of copper claims, where 25 men are working.—The Stauffer Chemical Co. has opened some good chalcopryite on the Conner claim.—Several tons of pig iron have been drawn from H. H. Noble's electric furnace. This is the first pig iron ever made on the Pacific coast or by a three-phase electric current under the Heroult process. The smelter has been closed temporarily as the Northern California Power Co. can not spare the current necessary to operate it.—L. H. Brown and C. F. Dougherty have recently shipped 50 tons of chromite to the Kennet smelter, to be used in lining furnaces.

SISKIYOU COUNTY.

The Blue Ledge copper mine, in the Elliott Creek district, 50 miles from Yreka, has been sold by W. H. Hamilton, George M. Keller, Marcellus Wenger, J. F. Reddy, and George N. Eaber, to Robert S. Towne & Co., of New York,

for \$200,000. The purchasers have held the property under bond, and have spent \$200,000 in development, running 2,000 ft. of openings. It is thought that a railroad will eventually be built to the property and a smelter erected there. T. W. Carnahan is the superintendent.—The Portland company, working the old Quartz Hill mine, at Scott river, is making some good clean-ups, and a good many large nuggets are recovered.—Some copper ore has been found at Oak Hollow, near Happy Camp, on claims under bond to Fred H. Dakin, Jr.

IDAHO.

KOOTENAI COUNTY.

(Special Correspondence).—The officers of the Green-Monarch M. Co. have been elected. L. H. Jeannot is president and manager, and L. F. Quirk, secretary and treasurer. The company owns a mine on Pend d'Oreille lake, northeast of Spokane.—J. H. Anderson, president of the Panhandle Smelting company, is negotiating with John Humbird for the purchase of \$150,000 worth of timber lands in northern Idaho. The property is along the Pend d'Oreille river and will give the smelter people a complete frontage along the river and far into the interior.—Another strike has been made in the Green-Monarch mine in the Pend d'Oreille district. According to the report it is a continuation of the Cargo strike made last winter. The tunnel was driven off the vein, and when a cross-cut was run, a low-grade ore was encountered when the workmen broke into the vein.—The Pondera Group M. Co., which is doing development work on Pend d'Oreille lake, has installed an air-compressor and a 30-hp. boiler. It has ordered a concentrator for the Climax group of eight claims, opposite Hope. The improvements will cost \$50,000.—Shipments of bullion have begun from the Panhandle smelter at Sandpoint, northeast from Spokane, which was blown in a short time ago. The company has placed an order for a furnace of 125 tons' capacity, to be installed in 60 days. T. L. Lammers, the manager, says that they are running on light charges at present and turning out 10 tons of bullion per day, and expect to increase to 15 tons. The value of the bullion varies from \$150 to \$300 per ton. They are closing up additional contracts for ore, and will have no difficulty in getting all that is necessary to keep the smelter in operation. These contracts are made with mines in the Cœur d'Alene, in Montana, and other districts tributary to Spokane.—The Bouton claim on Pine creek, in northern Idaho, has been bonded by Fred and Wiley Lasater, of Walla Walla, Wash. The claim is owned by Mrs. Tabitha Jones, of Walla Walla, and Theo. Jameson, of Wallace. The Bouton was located in 1887, and the assessment work has been done each year. The ore carries lead and zinc.

Spokane, July 10.

The Panhandle smelter at Sandpoint, which was blown in a month ago, is running full blast, its daily capacity being 150 tons, which will be doubled by the installation of another furnace. The company has contracts to keep it in operation for a year, and expects to pay off its indebtedness of \$38,000, within the next four months. In addition to the smelter, the company owns the townsite of Ponderay, the water-power, docks, steam tugs, and ore-barges, and also the Venezuela mine at the southeastern part of Lake Pend d'Oreille.—At the property of the Hayden Creek M. & M. Co., operating at Hayden lake, 42 miles east of Spokane, they are driving a tunnel from the creek, on the vein, and have obtained a depth of about 200 ft. and are 500 ft. in on the vein, which is 70 ft. between the walls. The ore is dry and will work with the cyanide process on the ground, being easy to mill. It carries gold and silver. There are 20 claims in that vicinity but little work has been done on any of them. The district starts near the lake and is close to Spokane. The country is easy for prospecting and it may develop into an important mining district.

SHOSHONE COUNTY.

The regular monthly dividend of the Bunker Hill & Sullivan Mining Co. has been declared for July. This is the 122nd dividend, and amounts to \$180,000, making a total for the year of \$1,260,000, and a grand total of \$9,126,000 disbursed by the mine.—Thomas L. Greenough was re-elected

president of the Snowstorm Mining Co. at the annual meeting at Mullan, the other officers and directors being: Vice-president, W. D. Greenough; secretary, John Mocine; William Hunter, John H. Heward, Brush Greenough, and J. Broad, directors. The report of the manager of the company shows that the property is in better shape than ever before in its history. The company has just declared a regular monthly dividend of \$45,000, or \$260,000 to date. It has \$65,000 in the treasury and \$140,000 worth of ore in transit. It is the only copper producing mine in the Cœur d'Alene.—Another strike has been made at Murray, where the cross-cut from the 600-ft. level of the Paragon mine broke into concentrating galena ore. The cross-cut was run from the bottom of the 600-ft. vertical shaft. The company has spent more than \$100,000 on the development of its property. The drift from the shaft was nearly 900 ft. long. The property is equipped with a 15-drill compressor, and is employing 30 men.—The Federal M. & S. Co., of which Charles Sweeny of Spokane is president, has entered into a contract with Robert W. Hunt and Leroy Tucker of Kingston for cutting 370,000 ft. of stulls for use in the Federal mines. The price to be paid has not been announced, but a \$2,000 payment has been made to bind the contract. Stulls cost from 15 to 22 c. per foot, so the contract probably exceeds \$50,000. The stulls will be cut near the Kingston spur.—The Golden Chest mine, at Murray, is making a big showing, strikes having been frequent at various levels the last few weeks. A cross-cut was recently started from a point but 250 ft. from the mouth of the long tunnel on the Idaho level. This cross-cut, when in 30 ft., broke into ore that carries gold, tellurium, and copper sulphides, and will pay for shipping without milling.—Following the strike of ore at the Montana Standard property, at Mullan, a few days ago, the management is preparing to erect a 200-ton mill, and to increase its working force. A surveyor is at the property to establish a starting point for a raise to the second level. The vein of the Montana Standard has been explored 20 ft., and is in ore. A former discovery was made in the No. 3 tunnel 1,200 ft. from the surface, and 1,600 ft. in. The property is owned by Ohio people.—George W. Harris, of Wardner, has obtained an option on the Kingston antimony mine at the mouth of Pine creek, east of Spokane, and will get the property in readiness for shipping. The mine has not been worked for years, because of the low price of the ore, but it has been a producer.—James F. McCarthy, one of the managers of the property, announced that the Oom Paul will be a mine in 30 days. The ore showings are becoming better and if the improvement continues the vein will be cut within a month. They are now driving on the vein, and with 12 men at work are making good headway. The shaft is down 500 ft., and the ore showings have improved with depth. At first the vein was but eight feet long and two inches wide, but at a depth of 150 ft. the vein showed a length of 75 ft. with a maximum width of 18 in.—Reports from Wallace are that a strike has been made on Champion mine on Stevens peak, the main tunnel, now in 775 ft., breaking into chalcopyrite. The ore is similar to that of the Monitor and the Bullion. The strike was made on the foot-wall of the vein. The tunnel has followed the hanging wall for some distance, but accidentally swung toward the foot. How far the workings have been parallel to the orebody is not known. Cross-cuts from the old workings will be made, and meanwhile driving will be done on the showing, which is said to be six feet wide.—Ore strikes at and near Murray are frequent and the north side of the Cœur d'Alene promises to develop into as important a producing district as the south side now is. A strike was made on a new location at the head of Toboggan gulch, a mile and a half from the Waite property, a few days ago. The vein has since been exposed in three places by open-cuts, the deepest being 20 ft. One cut shows 15 ft. of ore, with the hanging wall still unexposed. The ore carries lead, and some of it is of shipping quality. The owners are H. R. Hall, W. B. Blackman, W. A. Taylor, and A. P. Blackman, of Murray.—Three feet of concentrating galena ore, carrying a small stringer of pure shipping galena, has been made at a depth of 500 ft. on the Consolidated mine, south of the Oro Fino

and Bear Top mines, near Murray. The holdings cover 4,500 ft. of a vein parallel with the Oro Fino. The mine, which has been under development a long time, is opened by a 100-ft. cross-cut, which, after the lode was found, was continued for nearly 1,300-ft. as a drift. In the face of the long drift the recent strike was made.—The Stanley mine, near Murray, has sent another car of gold and antimony ore to the White Metal company of Granite City, Ill. The ore assayed an average of \$25.20 gold per ton and 40% antimony. The White Metal company has agreed to pay 15c. per lb. for the ore. The property is on Gorge gulch. Two shipments, netting \$8,554, were made last year and regular shipments are now to begin from the mine, which is regarded as ready to join the regular dividend payers. The principal owners are Herman J. Rossi, M. J. Farrell, and a number of Spokane men. The mine is under the management of W. W. Merk.

MONTANA.

BEAVERHEAD COUNTY.

The Elkhorn Copper M. Co. has made a strike in the shaft on the Blue Eyed Annie, at a depth of 200 ft. Driving is



The Coeur d'Alene, Idaho.

In progress from the bottom of the shaft.—A five-foot vein has been struck in the Park mine, and arrangements will be made to sink 1,000 ft. more.

ELKHORN COUNTY.

Good reports come from the Butte & Beaverhead property, in the Elkhorn district. L. J. Price is running a cross-cut on the 150-ft. level, and shipments will start as soon as the road is completed to the mine.—A vein has been struck at a depth of 200 ft. in the shaft of the Park Copper Co. The company will soon start shipping. R. J. Philpotts is the superintendent.

RAVALLI COUNTY.

Spokane men are interested in the discoveries of copper in the Woodchuck district, near Florence, where the Bonanza Copper Co. has awarded a contract for a cross-cut tunnel in the Whaley mine. When this cuts the vein, which the management expects it will do early in July, the vein will be followed on the foot-wall until it is under the outcrop. A longer cross-cut tunnel will be driven later to cut the vein at a greater depth. The officers are: Joseph Felton, president; J. H. Tilsey, secretary; W. J. Doust, treasurer. They own 15 claims, and shipping ore has been uncovered.

NEVADA.

ESMERALDA COUNTY.

(Special Correspondence).—The production of Goldfield mines for the week ending July 13 was 3,919 tons of ore—an increase of 500 tons over the previous week. The ore was from the following: Mohawk, 1,226 tons; Mohawk-Combination, 1,000; Consolidated, 500; Little Florence, 267; Mohawk-Jumbo, 251; Red Top, 305; McNaughton, 125; Loftus & Davis, 108; Reltz, 55; Hayes-Monnette dump, 55; and Florence M. & L., 27 tons of ore.—A winze is being sunk from the 200-ft. level to the 260-ft. level in the Red Top. A new vein has been struck in this level, a station has been cut, and east and west drifts are being run from the shaft.—A mill for the concentration of ore without the use of water has been installed by the Little Florence Co. The first tests have been successful.—The Loftus & Davis lease on the Combination Fraction has expired, and the mine will be operated by the company. An unsuccessful effort was made to secure an extension on the lease.—Another strike has been made on the 200-ft. level in the Daisy M. & L. Co.'s shaft on the Daisy.—Work has commenced on the Frances group.—A shoot of ore running \$75 per ton has been struck at a depth of 140 ft. in the Combination Fraction. The find was made in the north-east drift from the vertical shaft on the Mohawk Combination lease.—A four-foot vein of ore has been struck on the 350-ft. level on the Mohawk.—A 30-ft. quartz vein has been struck at a depth of 340 ft. in the Red King.—The shaft at the Goldfield Big Four is down 132 ft. A hoist has been ordered by the company. An orebody running about \$5 per ton is exposed at the bottom of the shaft.—A station is being cut on the 160-ft. level in the Lou Dillon Montezuma near Diamondfield.—The Nevada Mining & Scientific Society has invited the American Institute of Mining Engineers to hold its fall meeting in Goldfield.

Goldfield, July 20.

Lyon County.

(Special Correspondence).—The Ludwig mine has passed into the hands of the Nevada-Douglas Copper M. Co. The Ludwig has been a shipper of ore for several years. The ore is chalcopryite, in limestone.—The Bluestone is the most developed mine in the district, but it is not yet on the shipping list. The company has erected an experimental reduction plant, as the mine is a low-grade proposition.—Several churn and rotary drills are being used to prospect the holdings of the Nevada Empire Co. This property is owned by the Gelders, of New York.—A small smelter is on the ground, being used to test the ore.—Two working shafts and several prospect holes are being sunk on the Nevada-Douglas. A 2,600-ft. tunnel is being driven by three shifts on the copper vein recently exposed. Most of the ore thus far encountered is high-grade.—At the Western Nevada indications are excellent, and exploration and development work is under way.—Salt Lake parties are developing the Malachite and McConnell claims, and some good ore is in sight.—At the Mason Valley, in which the Guggenheims are said to be interested, some excellent ore has been found.—The Yerington Central is showing up well, ore having recently been found.—Several claims have been located in the granite belt, which lies between the two limestone formations, but it is doubtful if they contain any ore. Extensive explorations have failed to disclose valuable minerals in profitable quantities in the granite ridge, yet several promoters have endeavored to dispose of stock in companies which have no property outside this unproductive granite belt.—The camp will be supplied with electricity from the Truckee river for power and lighting purposes. Southern Pacific surveyors are outlining a route for the new railroad. Yerington is situated on the east bank of the Walker river, in the midst of a farming region, and supplies are cheaper here than at any of the desert camps.

Yerington, July 18.

NYE COUNTY.

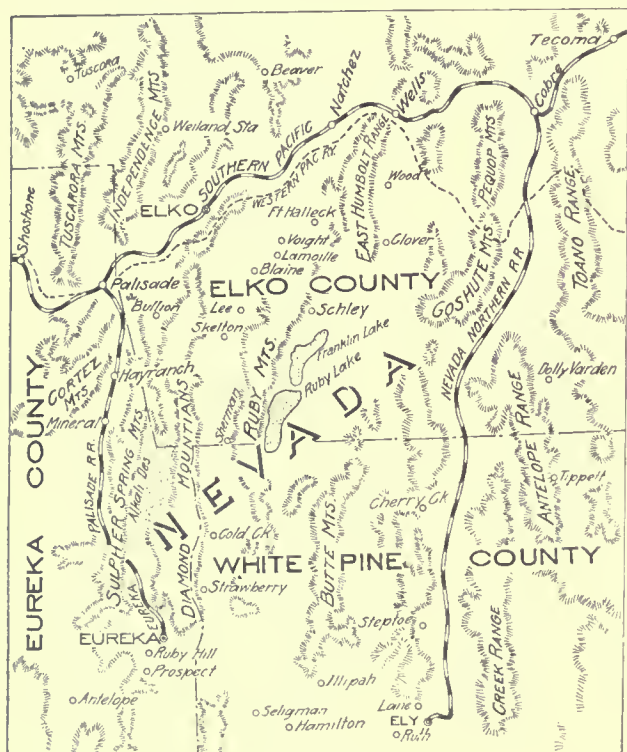
(Special Correspondence).—Tonopah mines produced 5,395 tons of ore during the past week, the yield being from the following: Tonopah, 3,580; Belmont, 1,285; Montana-Tono-

pah, 115; Jim Butler, 90; others 25 tons.—The 100-stamp mill being erected at Millers siding by the Tonopah Co. is nearing completion; 60 stamps are running and 10 more will be dropping in a few days.—The Montana mill is being rushed to completion.—The Tonopah M. Co. officials state that the failure of the mine to pay the extra dividend is due to the desire of the directors to retain sufficient capital in the treasury to guard against such dangers as the fuel famine, which hindered the operation of the property last winter.

Tonopah, July 19.

WHITE PINE COUNTY.

The power-line from the smelter to the Nevada Consolidated mines will be finished by fall, and the hoisting and underground haulage machinery at the Star Pointer will be ready by October. The concrete for the ore-bins and steel head-frame is being laid. Raises are being run in ore at the Ruth property.—A 15-h.p. gasoline hoist has been installed at the Robinson, and the shaft is down 100 ft.—Two churn-drills are operating near the Eureka shaft of the Nevada Consolidated property.—Some copper has been struck by the drills in the Weber and Clipper claims



Map of Eastern Nevada.

of the Ely Central. No. 5 hole has been put down 446 ft. in eight days. The Ely Central holdings are a crescent-shaped group, cutting across the porphyry belt and bordered on the north by the Nevada Consolidated ground. The property was acquired 18 months ago for Philadelphia capitalists, by F. S. and Joseph Pheby.—A good deal of prospecting is being done in the Eagle district, 90 miles from Ely. Much work was done there 30 years ago.—The Muncey company, for which Marcus E. Jones is manager, will be reorganized in Salt Lake. Two carloads of ore were shipped last year, that averaged 24% and netted \$3,000. The company controls the waters of Kalamazoo and Muncey creeks.—A party of Salt Lake men, who are interested in the McDonald Ely and Success properties, have recently visited the mines at Ely. The Golden Gate and Mill shafts, and the old workings of the Robust company, were inspected. D. C. McDonald is manager for the company.—Good reports come from Osceola. The Ely Golden Ledge Co. has five claims there, and a placer claim at Hogum. R. M. Leshar is the superintendent.

WASHINGTON.

FERRY COUNTY.

Special Correspondence.—From the No. 1 cross-cut, 40 ft. below the surface at the Copper Key mine, a stope has

been excavated 60 ft. long in a direction slightly east of north. This stope is 45 ft. wide at the north and 23 ft. wide at the south end, and a drift has been driven on ore northward 30 ft. There is ore the full length of 90 ft. in the roof, sides, and floor of the stope and drift. The quantity of ore shipped to the Granby smelter, according to the statement of the manager, E. L. Tate, was 2,195 tons, the returns from which amounted to \$7.75 per ton in gold, silver, and iron, leaving a net profit over the wagon-haulage, railway transportation, mining, and treatment of approximately \$2 per ton. If a tramway is built from the mine to the Belcher Mtn. railway, an additional saving of \$2 per ton may be effected. From the floor of the stope a winze was sunk 60 ft., and a cross-cut from the bottom runs 55 ft. in magnetite, to the hanging wall, which strikes a little west of south and pitches southerly. The average value of the ore is about \$7 per ton. The No. 2 adit was driven 263 ft., and a raise from that point of 45 ft. connects with the bottom of the winze. At 153 ft. from the portal of the No. 2 adit a cross-cut was driven 85 ft., of which 43 ft. is through ore with pyrrhotite, marcasite, calcite, and a little silica. About 3 ft. from the foot-wall a stratum of quartz ore, 2 ft. wide, was cut, which has small streaks of chalcopryite through it and contains about 3% copper.—The Copper Key Mining Co. owns a group of nine claims in the Belcher district. A survey is being made of the surface and underground workings. There is a quantity of ore exposed, and the full extent of the deposits is not yet known, but there is more good shipping material exposed in this than any other mine on Belcher Mtn.—After the survey is completed work will be conducted on the No. 2 adit level, cross-cutting toward the hanging wall, afterward driving on it, to determine the course of the vein, and then sinking on it. Later, a new adit will be driven, to tap the vein at greater depth. The Copper Key Mining Co. is organized under the laws of Washington, with 1,500,000 shares, at a par value of \$1 per share, with 500,000 shares in the treasury. The directorate is composed of J. L. Prickett, president; D. G. Russell, vice-president; E. L. Tate, secretary, treasurer, and manager; T. E. McBroom, E. J. Dyer, and W. L. Jones, all of Spokane, Wash.—A fine body of silver-lead ore is reported to have been encountered in the Winnipeg mine.—The silver-lead vein on the Colville North Half group, north of Winnipeg, is improving with development. There is 15 tons of ore on the dump ready for shipment. A shaft is being sunk on the vein.

Republic, July 20.

J. C. Beidoliman, manager of the Amalgamated Republic Mines Co., which has taken options on seven properties near Republic, states that work on the construction of the mill at Republic will begin at once. He is closing a deal for the purchase of the old Republic mill, which has been abandoned. New machinery will be installed in the mill and work begun by the first of next year, and by a new process they expect to make it possible to handle the ore of the Republic mines at a good profit, at a cost of from \$2 to \$3 per ton. The mill will have a capacity of 280 tons daily. Experiments show that 90% of the gold and 95% of the silver may be saved.—The management of the Bortle Copper-Gold Mining Co. announces that a copper smelter will be erected this summer near Curlew lake, in northeastern Washington. The 500-acre tract will be platted and made into a townsite. There is a saw-mill on the ground and the construction of the smelter buildings will be begun within the month. The company's survey for a standard-gauge railroad from the lake to Belcher Mtn. is being pushed. The maximum grade so far is under 2%, and the curves are light. Construction work will begin soon.—The San Poil M. & E. Co. and the Seal Mining Co. have been incorporated in Washington to operate near Republic. The trustees are Charles E. Skiles, John W. Mickle, and M. Hannaford, of Philadelphia, Casper Howarth, of Chester, Pa., and A. L. Wright and S. L. Boyer, of Spokane. Philadelphia is to be the principal place of business. S. L. Boyer is general manager. The companies own nine groups of gold and copper claims.—G. Weaver Loper, president of the Colville M. & S. Co., operating near Republic, will install three 40-ton rotary furnaces on the property and have them in operation within 90 days. Other equip-

ment includes ore crushers and four electric compressor drills. They have improved 10 miles of the road from Republic to Park City and have built a road from Park City to Nespelem, 14 miles, and are now constructing a flume on Gold creek, seven-eighths of a mile long. Ore is being shipped to Nelson for demonstration purposes, pending the completion of the smelter. They are sacking three carloads of ore to ship to Nelson, which will average about \$1,000 per car.—Core-drilling will begin at once in the North Half group.—H. J. Hibschem, of Davenport, and G. P. Garwood, of Keller, have closed a deal to buy and consolidate the Last Chance, New York, Reno, New York Fraction, Bonanza Fraction, and half of the Palmer Fraction lode mining claims near Keller.

BRITISH COLUMBIA.

The shipments of ore from the Rossland mines during the week ending July 13, were unusually large. The Centre Star broke all its previous records with over 5,000 tons. The following is the tonnage shipped from Rossland during the week: Centre Star, 5,010 tons; Le Roi, 2,240; Le Roi No. 2, 595, and White Bear, 210 tons of ore. Total for the week, 8,055 tons, making 146,147 tons for the year to date. The large compressor at the Centre Star is working. The work of development continues on the fourth and eighth levels of the Idaho. The ore that came from the old Centre Star workings and that has been on the dump for nine years, is being taken out by means of an inclined tramway, and shipped to the Trail smelter. In the Iron Mask stoping continues on the 400, 250, and 200-ft. levels.—At Le Roi, driving continues on the 200-ft. level of the Spitzee, and cross-cutting has begun to the south from the 1,650-ft. level toward the winze-workings. The ground west of the Josie dike is showing up well and furnishes a good deal of ore. At the Glant-California 25 men are working and a shaft will be sunk near the end of the California.

The Trail smelter received 5,781 tons of ore during the past week. In addition to the Rossland shipments, other sources of supply were as follows: Victoria, Nelson, 219 tons; St. Eugene, Moyie, 391; La Plata, Kokanee creek, 78; Arlington, Erie, 65; North Star, East Kootenay, 33; Rambler-Cariboo, Sloean, 33; Arlington, Sloean, 22; Lone Bachelor, Sloean, 21; and Sunset, 20 tons of ore. At Le Roi smelter at Northport, 2,240 tons were received from Le Roi mine. Three furnaces, treating 600 tons per day, are running, and the stock-pile contains only 20,000 tons of ore.

The smelter receipts for the week ending July 13 were as follows: Grand Forks, 18,742 tons; Greenwood, 14,730; Boundary Falls, 3,555; Trail, 5,781; Nelson, 273; Northport, 1,910; Marysville, 600. Total for the week, 45,591 tons of ore, and for the year, 757,455 tons. Many of the smaller properties are being developed in the Boundary region. Work has been resumed at the Bay mine, and shipments should soon start. The Diamond-Texas shaft is down 60 ft. in quartzite, and work will soon start on the Prince Henry.—The new electric compressor is working at the Sunset, and 30 men are employed. The International Coal & Coke Co. has closed a contract with the Canadian Pacific railroad for its entire output of coal, about 2,500 tons per day. The Fremont shaft is down 80 ft., and has been in ore part of the way. This mine adjoins the Strathmore.—It is expected that the Lenora copper mine and the Mt. Sicker railway will soon be opened and that ore will be mined this fall. This property was purchased this spring by the Vancouver Copper Co., a corporation of London, with a capitalization of 85,000 shares of \$5 each.—The Strathmore shaft is down 150 ft. and eight men are working there. About \$20,000 in high-grade ore has been shipped from the property.

In the Sloean district, a new concentrating mill is being built at the Blue Bell, at Ainsworth, for the recovery of lead and zinc.—The Reco is being worked again after being closed down for a year.

MEXICO.

CHIHUAHUA.

Parral produced 6,575 tons of ore during the week ending July 13, 2,725 tons being shipped to smelters and 3,850 tons being locally treated.—Bert Peterson and associates did

not purchase the Palmilla mine, and a 15-year lease on the property was given to J. F. Flynn and Eugene Davis of the Capazaya Mining Co. The mine has produced a great deal of rich ore, but has been badly worked, and the recent fire will necessitate a large initial expenditure, and the lower levels will have to be unwatered.—The Santa Rosalia smelter will be blown in again, and fuel, ore, and a working force are in readiness for the start. The plant has been idle for some time owing to dissension among the stockholders. The Lepanto mine is producing about 1,000 tons of ore per month, carrying lead, silver, and gold. This property is in the Naica district, and is owned by Antonio de Stefano, and is being operated under a 10-year lease by the Smelter No. 2 of Monterey. James A. Garrett is the superintendent.—The new 300-hp. electric plant at the Veta Colorado M. & S. Co.'s property at Villa Escobedo, has started, and work on the concentrator is progressing. A cross-cut is being run from the Buen Viento shaft under the San Rafael hill.

DURANGO.

It is reported by G. C. Palmer that Robert S. Towne and associates of New York are to finance the construction of a railroad between Zacatecas and Durango. The road will pass through Sombrerete, Nieves, La Noria, and San Matian.

JALISCO.

W. R. Ramsdell has taken a three-months' option on the Expectativa mines in the Ameca district, for \$200,000. These mines are 10 miles southwest of Ameca. Development work has been going on for two years and 10,000 tons of ore are developed, carrying copper, lead, silver, and gold. The ore will probably need concentration.—John M. Topper of Philadelphia has purchased the Purisima copper mine in the Ayutla district.—The Santo Domingo mines in the Hostotipaquillo district are shipping ore regularly to the smelter at Esatlan. Air-drills will be installed in the Esperanza and San Pedro tunnels.—The copper smelter purchased by the Carrizo Copper Co. for its properties in the Autlan district, will be erected at Ayutla and run on custom ore. A. L. Waters will be in charge. The Carrizo ore will be concentrated and the concentrate shipped to Ayutla.—The extension of the Guaymas-Guadalajara railroad is progressing.—The Bolaños Mining Co. of St. Louis is attempting to have set aside the court sale of the Bolaños mine to A. Belster. At one time these mines ranked fifth among the silver-producers of Mexico.—The Virginia & Mexico M. & S. Corporation has started work on the recently-acquired Cabrera, Peralta, and America mines, and 50 men are at work under Cesario Vargas. A tramway two miles long will be built and a new mill constructed.

SONORA.

At Cananea, more ore is being found in the Capote deep level at 1,050 ft. The presence of ore at this depth is considered a favorable indication for the future of this camp.—At the Cananea Ore Reduction Co.'s plant, the experiments on concentrating the fine tailing with tables are proving successful. The equipment is only experimental and the operations have been hampered by an irregular water supply, but this will soon be remedied. The plant is designed to treat the millions of tons of impounded tailing.—At the Sierra de Cobre, good ore is showing in the Limestone tunnel, but no ore had been cut in the lower tunnel. In the main shaft a pump-station is being cut on the 800-ft. level. From this point cross-cutting is being done.—English engineers, with Robert Mitchell, are examining the South Cananea property. The No. 1 and 2 shafts will be sunk and development will start on the south end of the property.—Michigan shareholders have been visiting the Ortega property. The Native shaft is down 65 ft., and will be continued to the 250-ft. point. An increased flow of water was encountered in the Huerfena shaft.—L. F. Gray, who is operating a silver-gold mine near Arizpe, is running a 10-stamp mill on the property, and will add a cyaniding equipment.—The first shipment of lumber from the Greene-Cananea mines has arrived from the mills of the Sierra Madre Land & Lumber Co., which will furnish the entire supply in the future, thereby saving the high haulage charges on Oregon pine. A direct railroad line may be built from the lumber camps to Cananea.

Special Correspondence.

London.

Deep Lead Mines. — Explanations and Prospects. — Zinc Corporation. — The Battle of the Processes. — Tin Discoveries in Australia. — The Ymir Mine. — Stratton's Independence. — Oroville Dredging. — Recovery of Mining Market.

At a recent meeting of stockholders in one of the companies which finance the group of 'deep lead' mines in Victoria, some necessary light was thrown on the circumstances that have brought about the adverse market position of these enterprises, the result of the delay in reaching the 'deep' ground, which six months ago the managers thought would be "a matter of a few weeks." The report states that toward the end of the year the public awoke to the fact that the Loddon Valley company had overcome the water, and upon that there was a considerable rise in the shares, as it was thought that the moment that the company got to the bottom of the shaft they were going to find vast quantities of gold which only needed to be shoveled out. That was not the view of the board; on the contrary, they knew very well that they had a great length of lead to deal with, and that they would have a large amount of development work, cutting across the river, and cross-cutting again from there, in order to find out where the payable runs of gold were. The former history of these 'deep lead' properties as worked by Australian owners, which had been such a marked success—having got out about £6,000,000 sterling—had been the same as in the Loddon Valley company. They had not had anything like the same difficulty with the water; but they had to discover where the runs of gold were in the old river-bed. C. Algernon Moreing, in referring to the samples of gold taken out from their trial washings, said he thought it would be interesting to see how uniformly they had found the gold in every part of the wash. In some cases the gold returns were of a very satisfactory nature. A sample of gold taken out from three fathoms of ground in a long cross-cut which had been put across the wash weighed 90 dwt., and was equal to 30 dwt., or 1½ oz., per fathom. Another sample from three fathoms in the same cross-cut gave 70 dwt., equal to 23 dwt. per fathom. The net result was that the 204 ft. which had been driven across the wash showed 17 dwt. 9 gr. per fathom. That was the result of 204 ft. across the wash of the Loddon at the present time. It was by no means a remarkable result; but they expected soon to get into a deep gutter, or channel, which would show a much higher yield. In their opinion, as engineers, the cost of working the wash would be about 8 dwt. per fathom, and everything over that would be profit. A Victorian Government geologist (Mr. Stanley Hunter) had given it as his opinion that it would require 10 dwt. to pay the working cost; but he (the speaker) thought 8 dwt. would be ample. He mentioned several cases of working companies which bore out his statement. At the present moment 'deep leads' were being worked in Victoria at a working cost not exceeding 8 dwt. What was being done at the Loddon was to drive through the wash to find the deep gutter where the rich gold was concentrated; but they had not yet reached that point, though they had found, as they approached the deep gutter, that the samples from the boreholes were richer. Although they did not regard these samples as giving any indication of the real value per fathom, what they found was that where the boreholes were richer the wash was always richer, and therefore they had every reasonable expectation that there

was much richer ground ahead of them than they were now working.

The Zinc Corporation has entered on a new phase in the vicissitudes of fortune that have marked its career since the establishment of the company some 18 months ago to deal with the enormous accumulations of tailing from the large Broken Hill mines. The Potter process for the recovery of zinc, lead, and silver was chosen as "having been definitely proved to be successful on a large commercial scale." Some 12 months later the results obtained were deemed to justify the increase of the company's capital from £350,000 to £500,000 for the expansion of the concentrating plant and the construction of a smelting works. The issue of 113,333 of the new £1 shares was guaranteed at the price of £1 5s. for the consideration of an option on the balance of the shares at £2 each. The market price of the stock rose to 55s., but a sharp fall on heavy Australian selling took place toward the end of February last. This was followed by the announcement that the Queneau system (the Potter process with the addition of magnetic separation) was not a commercial success, and that the Cattermole process,



Map of Part of Victoria, Australia.

which had absolutely solved the treatment of the tailing, was to be adopted. The shareholders are now informed that at extraordinary general meetings of the company, held in Melbourne, resolutions have been passed by which the head office of the company has been transferred to London, and that the London committee is now the board of the company. W. L. Baillieu and William Clark (who, by the way, were among the guarantors of the new capital) have resigned their seats as directors. Robert Skipwith, a partner in the firm of Chaplin, Milne, Grenfell & Co., and Henry William Pelham Clinton, a director of the Ivanhoe Gold Co., have been elected to fill the vacancies thus created. On the publication of this news the shares dropped to 5s., although they are a little better market at the moment of writing. It is thought that reconstruction of some sort for the purpose of raising more capital is inevitable. During the month of June 5,067 tons of tailing was treated; there was recovered 992 tons of concentrate, assaying 44% zinc, 7½% lead, 10 oz. silver. Assay of tailing, 16.26% zinc. Residue, 6.97% zinc.

It is reported that the West Australian Minister for Mines and the State Mining Engineer, who are touring the northwest mineral districts, have discovered what they

believe to be a mountain of tin near the town of Wodgina, which is hidden in the heart of the hills, one spur of which rises about 700 ft. above the plain and divides the field in two. Several mines of great promise are being worked on it, and there is a resemblance, in many respects, to Mount Bischoff, in Tasmania. Free tin is found in large quantities in granite lodes running in all directions through the schistose formation. The manner of working is simply to hand-pick the free tin and separate the finer tin by dry-sieving. In this way about 36 tons of ore, averaging about 68 or 70%, is raised and sent away monthly. Tantalite lodes to the north of the town were also inspected. A fine body of this ore was showing in the face of an open-cut on the hillside. Owing to the absence of a market, mining operations are at present suspended. A good many tons of free tantalite ore is at grass, and there is apparently as much more available as the market will be able to take for some years. A few tons have been sold at prices ranging up to £320.

Recent reports from the Ymir mine, in British Columbia, are considered satisfactory. Since the provision of extra capital by the issue of debentures, much progress has been made both in regard to equipment and development. The latest news is to the effect that crushing will start on July 15, and recent developments give promise that the ore which will be put through the mill will show satisfactory profits. This is the ore from the old vein, but the indications point to a discovery within a short period of an entirely new vein which may prove of great value. Stockholders look upon the present position as distinctly encouraging.

The new milling and mining scheme put forward by the directors of Stratton's Independence, on the recommendation of their consulting engineer, Phillip Argall, was unanimously approved by the general meeting of the stockholders. Mr. Argall, who was present, made a well reasoned statement of the actual position of the mine and of the prospects of the Company after the inauguration of the new plan of working. He wound up his address, which was very cordially received by the meeting, by stating that the dumps alone would occupy the full capacity of the mill as suggested by him, for six years, and he thought a reasonable estimate would be that the aggregate tonnage to be derived from the dumps and from the low-grade ore in the mine will be ample to keep a mill of 10,000 tons per month capacity in successful and profitable operation for 8 or 10 years to come.

The London committee of Oroville Dredging announce that at the annual general meeting of the stockholders, held at Portland, Maine, on June 19, a resolution was unanimously passed "that dividends be continued upon the present basis of 2½% per quarter until such time as a reserve fund of \$250,000 (£50,000) has been accumulated, and that thereafter all earnings over and above operating expenses be from time to time divided among the stockholders." It is estimated that after providing for the eighth quarterly dividend the balance of net earnings, together with the fund accumulated from the depreciation written off plant, machinery, etc., should produce a total approximating to the required surplus and the directors expect, therefore, to be in a position, after payment of the 9th and 10th quarterly dividends at the rate of 10% per annum, from the profits for the first half of the third financial year, to January 31, 1908, to distribute to the shareholders, in addition, a bonus of 2½%, and to continue such semi-annual bonus regularly, thus bringing up the total distribution per annum to 15%. It is further stated that any surplus profits which may accrue after payment of dividends and bonuses aggregating 15% per annum, will be dealt with in the directors' discretion,

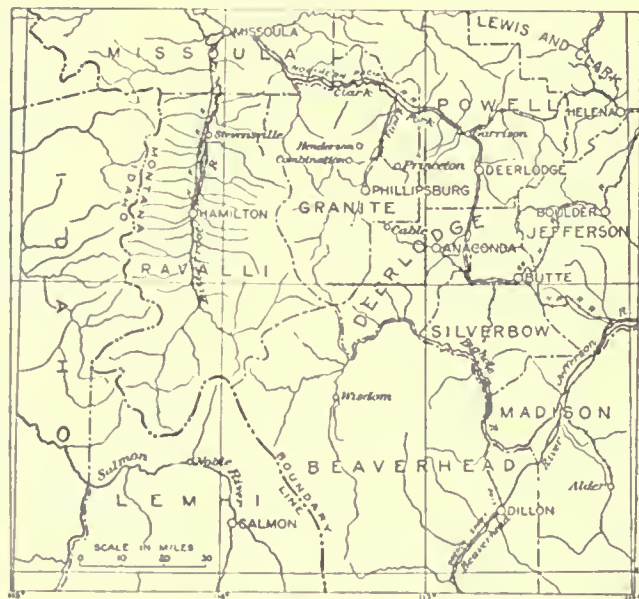
either by increasing the semi-annual bonus, or by addition to the reserve fund.

The persistent downward tendency in the mining market appears to have received a check. The fortnightly settlement just concluded exhibits a fairly general, and in some cases a marked, recovery.

Butte, Montana.

Wages and Price of Copper.—The Corbin District.—Fire in the Minnie Healey Mine.—Discovery in the Maggie Claim.—The New Departure.—Sapphire Mining.—Water in Shafts.

The drop in the price of copper and the continuing dullness has created some uneasiness in Butte in apprehension of the possibility that the price of the metal may fall back to 18c. per pound, at which price the Butte miners have contracted to return to the old scale of wages, \$3.50 per day. When the miners made a demand for an increase to \$4 per day they entered into a contract with all the mining companies for a term of five years, agreeing to return to the old scale if the price of copper



Montana.

should drop again to 18c. When the contract was made the price ruled from 25 to 26c., and few persons thought it would go back to 18c. soon, if at all. Since the contracts were made the Western Federation of Miners voted to repudiate all such contracts between miners and employers, and made it unlawful to enter into similar contracts in the future. There is a general doubt whether the Butte miners would, in view of the Federation vote, accept a reduction in wages.

The ore in the lower adit of the Boston & Corbin Co. is increasing in width and value as progress is being made. A double-compartment shaft is being sunk from the adit, from which, at a depth of 200 ft., a cross-cut will be driven under the orebody. It is expected that within two months ore will be opened below the water-level. In excavating for a well recently, a fine vein of ore, about a foot wide, was cut on the Butte & Corbin ground. Other companies and individuals are pushing exploration work in the Corbin district. The Butte & Corbin Consolidated Copper Co., working on the east side of Valparaiso Mtn., has cut a vein carrying lead and copper. The Daly group of claims has been bonded to Eastern parties and preparations are under way to begin development work. There is a shaft on this property from which some ore has been shipped. The Jefferson-Montana Co. has installed new machinery and is running a cross-cut on

the 500-ft. level, the face of which is in 250 ft. There are two veins in the Jefferson-Montana ground, the larger one of which is about 500 ft. from the shaft. A shaft 240 ft. deep has been sunk on the Black Jack claim by Martin Mulvahill and partners. A station is being cut and the work has exposed the foot-wall of a vein, which will be explored when the station is completed. The main vein is believed to be about 65 ft. from the shaft.

Fire that broke out in the old workings of the Minnie Healey mine, between the 600 and 800-ft. levels, has proved more serious than anticipated. Mining had to be entirely suspended in the Minnie Healey, one of the Butte Coalition properties, and in the West Colusa, a Boston & Montana mine; moreover work could be done in only a small portion of the Leonard. The three mines are connected by workings, and the gas from the burning ore became so strong that the miners had to leave. When the fire-fighters thought they had the combustion confined to a small area in the Minnie Healey, it was discovered that it had made its way down to the 1,200-ft. level, but soon it was extinguished between the 800 and 1,200-ft. levels, and the fire was fought from all sides with steam and water. It was then only a question of time until it would be under control and the mines freed of gas.—The last of the three big air-compressors for use in the Leonard mine has been started up and works fine. The three compressors will operate about 150 drills, and occupy one large building. The eight new boilers at the Leonard are also in commission. They have a total of 2,000 horsepower.

A vein of sulphide copper ore two feet thick has been struck in the Maggie claim at a depth of 80 ft. The Maggie is a fraction lying between the Bullwhacker and Montgomery claims on the east side and is being developed by the owners. The vein has an east and west strike, it was found in a cross-cut 200 ft. from the shaft. In the Bertha, another fraction, situated a little northeast of the Maggie, some ore has been struck, but it is in the north and south fault-vein, on which the Bullwhacker is mining. Both the Bullwhacker and Bertha ore is silicious material having an average assay of about 4% copper. This vein has been a mystery to operators on the east side, as no one knows where it starts or where it ends. Until it was found in the Bullwhacker, no one knew of a north and south vein in the whole Butte district. Beyond the Bullwhacker, the Bertha, and Montgomery the fault-vein has not been developed, and its extent is therefore unknown. However, where mining has been done on it, it has yielded some very good ore.

The New Departure Mining Co. has practically completed the development work outlined at the time it purchased the property, and the company will devote itself to ore extraction, as there is a large quantity of it opened. A shaft 100 ft. deep has been sunk from the old adit-level and from the bottom the veins have been opened by cross-cuts. The New Departure is a silver mine, though the ore also runs well in gold and copper. The property is owned entirely by Butte men. Enough ore was taken out of the mine during development and exploration to pay for the work and leave a good balance in the treasury.—The companies mining for sapphire at Yogo are having a successful season, there being an abundance of water. Work has been resumed on the

Lehman group of claims, and the output of the London company will be the largest it has ever made.

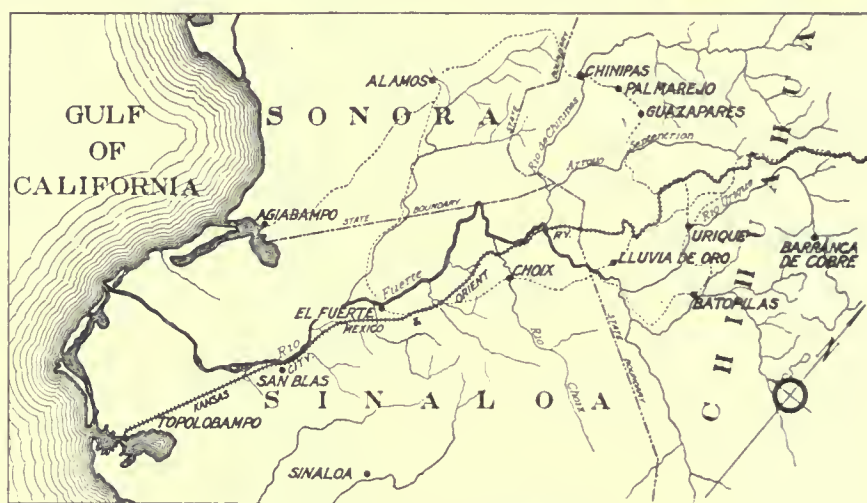
Practically no water has been encountered in the various shafts that are being sunk north of the North Butte mines. The Butte-Milwaukee Co.'s shaft on the Colonel Sellers is down 460 ft., but there is hardly enough water in the shaft to provide moisture for the drills. The shaft on the Badger State is down 440 ft., and there is very little water to contend with. The Butte & Bacorn Co. is cutting a station at the 1,000-ft. point, and is not bothered with very much water.—The shaft being sunk on the Greenleaf by the Boston & Montana Co. has reached a depth of 900 ft. The company is also sinking the Mountain View and West Colusa shafts deeper. The former is to be made 2,200 ft. deep and the West Colusa 2,000 feet.

Mexico.

Railroad Building in Sinaloa.—Interference With Cost of Labor.—

Lluvia de Oro.—New Cyanide Plants in Chihuahua.—Improved Methods.

Until recently the railway system of the State of Sinaloa was represented by two short lines running from the coast to towns in the interior. The aggregate mileage



Sinaloa and Part of Sonora, Mexico.

could not be more than 85 miles. Today the Southern Pacific system is pushing the extension of the C. R. Y. y P. railway from Navajoa (in Sonora) well into Sinaloa. Within two months the section between San Blas (a few miles below El Fuerte) and Navajoa will be completed and in operation. Grading is now under way south of the Fuerte river, and every effort is being made to reach Mazatlan by the first of the year. The construction of this road is denuding the entire country of men and animals. The high wages being paid by the railroad has also had the effect of discontenting the vast majority of workmen in the State. While all welcome the railroad, the abrupt change of conditions is creating many difficult problems. Owing to the shortage of labor the cornfields are not being cultivated as actively as usual, and this, combined with the heavy demands of the contractors on the native supplies of corn, is having the effect of pushing the price of corn to an unprecedented height.

The Stillwell road, which has been working in a modest way for the last two years, has practically completed grading to the Choix river, and it is authoritatively stated that it will be in operation before the first of the year. This road will furnish means of ore transportation to the Pacific Coast smelters for a number of promising mining districts near Choix, as well as shortening the pack from the railway to the mountain mining camps.

It is stated that mining operations are to recommence

very shortly at the Lluvia de Oro. The mine has practically closed down for a year, pending the erection of a large treatment plant. The Mexico property is being actively developed by the Sierra Madre M. & D. Co. with satisfactory results. Recently two high-grade ore-shoots were discovered. The mineral is silver-copper, with some native silver ore. The discovery of this vein caused a local sensation about 18 months ago on account of the very rich ore, and because of the beautiful native silver specimens. Since the purchase of the prospect, about 10 months ago, by the Sierra Madre M. & D. Co., the amount of work done has been considerable, and the results justify the hope that the property will become one of the best mines in Sinaloa.

The mill of the Republica company at Sanz, in Chihuahua, has begun operations by dropping ten stamps. Two Wilfleys produce a concentrate worth up to P2,400 per ton. This plant will have a good cyanide plant, including air agitation, tube-mills, and some kind of vacuum-filter for slime treatment. Freight from the railroad is at the rate of P7 per carga. Water is abundant, and a power-plant will be built. The mill has a good saw-mill, and is close to fine pine timber-land. Good cool houses are being built for the American contingent. The mine is at an elevation of 5,000 ft., and enjoys a pleasant climate throughout the year.—The 20-stamp pan mill at Sahuayacancito is closed down for an indefinite period. Amalgamation proved unsuccessful on P25 ore. The plant could be remodeled easily and inexpensively into a fine-grinding cyanide plant, and would make money on such ore. Wood costs P9 per cord, but water-power is available nine months in the year. The condensing engine is a model of sectionalizing, and must have cost a fortune to lay down at the mill. A tailing pile of perhaps 15,000 tons—all that is left after summer rains—runs well in gold and silver.

The mill at Potrerito, owned by Juan A. Creel, of Chihuahua, is closed down, and is another example of a mill that could be made to pay handsome returns on a small additional investment in a cyanide plant. The western part of Chihuahua seems to be dotted with such plants. The Greene Co. had several such mills at Ocampo, all of which are now torn down. W. F. Thompson has started the Watterson mill as a cyanide plant, and, judging from results of experiments, will make much better extraction. He will cyanide the concentrate—a thing not successfully done heretofore on this class of ore. The Palmarejo-Mexican mill at Zapote was formerly a pan plant. It is now cyaniding, and upon the completion of the Butters filter, and the erection of a new classifying system, the mill will even better its present record. The slime-plant will consist of a 40-frame filter, which will allow of the re-treatment of old slime, besides handling the present output.

Salt Lake, Utah.

Utah Consolidated Plans.—Heinze Buys Smelter Site.—Harriman to Enter Bingham.—Zinc Ore Treatment.—Shipments from Park City.—News from Mercur.

The Utah Consolidated Mining Co. has not abandoned its plans to build a new smelter on the west side of the Oquirrh range of mountains. Reports to the contrary have been circulated recently, but J. B. Risque, the manager, states that the work will go on, though nothing is likely to be done in the way of construction this year. It is learned that the company's engineers have recently completed the survey for the proposed aerial tramway over the mountains, and have reported that it will be only slightly longer than the one operated at the present time, which is about 12,000 ft. It is also proposed to build

14 miles of standard gauge railroad to the smelter from a point near Garfield, where connection can be made with the main lines of the San Pedro, Los Angeles & Salt Lake and Western Pacific railroads. The company has recently completed the purchase of all the ground it needs for a smelter site and has secured the necessary water rights.

The agents of F. Augustus Heinze have recently purchased a large acreage of ground at Lake Point, about two miles west of the old Garfield Beach bathing resort on the south end of the Great Salt Lake; this will be the site of the smelter that Mr. Heinze and his associates intend to erect. The property has been obtained for the Miners' Smelting Co., organized not long ago under the laws of Maine. The site is a very advantageous one, since it will be accessible by all of the railroads entering the State. It is stated that Mr. Heinze is interested in a proposed interurban electric line from Salt Lake to Bingham, Garfield, and other local points and that behind it all is an understanding with E. H. Harriman, which will give the latter an entrance into Bingham. Under an agreement made several years ago, the Union Pacific and Oregon Short Line roads were to keep out of Bingham, leaving the field exclusively to the Rio Grande Western. In late years, Bingham has grown into such importance that the Harriman management has been anxious to get a share of the business derived from the operation of the mines and mills of that district, but this old agreement has prevented. By bringing Heinze into the suburban scheme the way would be open. On top of this comes the report that someone has secured an option on the Saltair Beach railroad, which could be extended to the Heinze smelter site with very little difficulty and it would immediately become a paying property.

A. J. Beetles, chief metallurgist for the Newhouse mining interests, has made the statement that he expects to have at least a portion of the Boston Consolidated mill at Garfield in operation by September. Splendid headway is now being made with construction.—The fourth unit of the Utah Copper Co.'s Garfield concentrating mill is in successful operation and the fifth is practically ready. Within a month the six sections will be running and treating ore on the basis of 3,000 tons per day.

An Eastern and local syndicate has in hand a project to erect a plant for the treatment of zinc ore at Park City. Officials of the Daly Judge Mining Co. are interested in the enterprise. It is expected that work will begin on the plant within the next sixty days.—Ore shipments from the Park City district last week amounted to 2,694 tons. Among the contributing mines and respective amounts were: Daly Judge, 592; Silver King, 838; Daly West, 492; Little Bell, 68; Jennings Con., 38; Copper Apex, 56 tons.

The Consolidated Mercur Gold Mines Co. is preparing to extract ore from the Brickyard mine, which was worked successfully several years ago. A recent sampling shows a large tonnage of low-grade ore. The slime plant being built by this company is about ready for trial, word having been received that the last of the equipment has been shipped.—The United Mercur Gold Mines Co. has been organized to develop a large tract in the camp of Mercur. As a basis for organization, the promoters have acquired the East Golden Gate mine and a controlling interest in the Ingot. Samuel Newhouse is mentioned as president of the company.—The Utah Copper Co. now has five steam-shovels at work on its Bingham property. Two are being used on ore and the balance in moving overburden. The latter has been cleared from an area about 600 ft. square. The surface deposit here had a thickness of 65 ft. The big bins in which to store ore from the underground workings, are now complete.

Leadville, Colorado.

Increased Importance of Placer Mining.—Work at Robinson.—Zinc Production.—News of Developments.—Successful Lessees.

It appears from the magnitude of the development work being carried on during the past few months by the Ximo Gold Mining Co. and neighboring companies that placer mining will again assume a position of importance in the Leadville district. The Ximo company secured 134 acres of patented placer ground near the junction of the south fork of the Arkansas river and Colorado gulch; a force of men is at work under the management of Timothy Kyle, with J. D. Page as superintendent. This company intends to install modern machinery at an early date.

At Twin Lakes extensive work is now being done with modern placer machinery and it is reported that a large acreage of placer ground has been secured by a Chicago company in the same vicinity.

Development work continues at the Reindeer shaft on Rock hill. It is expected that the shaft, which is now 840 ft. deep, will soon cut another contact; meanwhile the shipment of ores from the upper level continues. H. M. Shepherd, the manager, reports the deep shaft of the International Mining Co. of Robinson as being very near the contact that it was intended to cut. The property being developed by this company is locally known as the Robinson mine and has been an important producer for more than 20 years. When last worked the stopes were carried to the lowest point the water would permit, but the new shaft will enable the company to drain a large area heretofore untouched.

In spite of the fact that the Eastern zinc districts have increased their production materially, the local market does not show any ill effects. Purchasers are asking for increased shipments. It is expected that before the close of the year the supply will be considerably increased, since the larger bodies of zinc ore from the Louisville No. 2 shaft, the Tucson, Moyer, and certain newly developed zinc ore-shoots of the Yak company will become available.

Development work on various properties in Iowa gulch is proceeding satisfactorily and many new enterprises are under way. Major Bohn has made several important shipments through the Ready Cash tunnel from his Aurora property and at an early date he expects to increase his shipments to double the present amount. In the early days in this part of the district many shallow shafts were sunk, showing good ore, but water prevented deep mining.

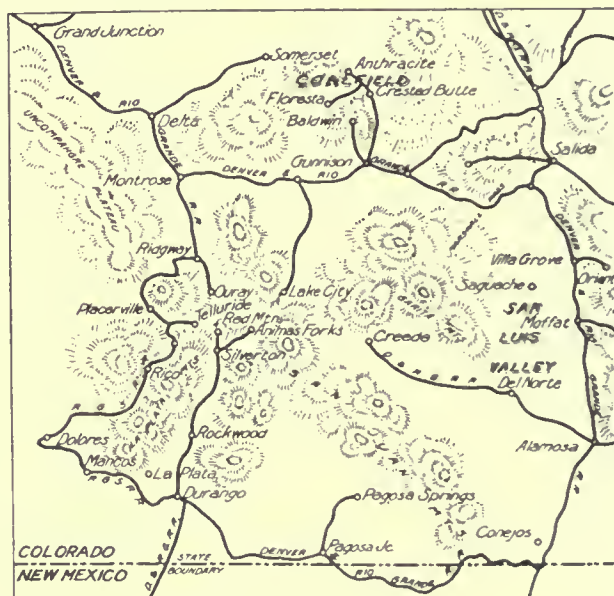
The shaft at the Sunday mine on Ball Mtn. was completed to a depth of more than 450 ft. and connections are being made with the old shaft. Shipments will soon commence from the shoot opened up at the 450-ft. level. Eastern parties are reported to have made a deal whereby a large group of claims in upper California gulch will be developed, among which are the Eurydice, Joy Bird, and Grover Cleveland. Lessees on Fryer hill have made several discoveries lately, which shows that the rich pockets of that famous hill are not exhausted. Several lessees report pockets of silver ore and the Forepaugh is shipping about 20 tons daily.—The Rebote Mining Co., an enterprise that began operations on Rock hill during the early part of May, is making good headway with its new shaft. Alfred F. Wuensch, the manager, has installed an electric hoist which has proved to be very economical and satisfactory.—The shaft of the Foxy Grandpa Mining Co. in Iowa gulch is still being sunk at a rapid rate. A body of zinc ore was encountered more than a month ago, which later developments prove to be valuable in both zinc and silver.—It appears certain

that the Gold Bug property in English gulch will erect a stamp-mill. The tests made on a large lot of ore in Denver have convinced the manager of the advisability of doing so. Much activity is reported in connection with the placer operations of a new Chicago company on Lord's ranch. A dredge has been ordered and will be erected and in operation before the close of the year.

Denver, Colorado.

Cripple Creek Dividends.—Smelter at Lake City.

The annual meetings of the stockholders of the Elkton and Mary McKinney mining companies were held during the first week in July. Both companies report satisfactory progress, the gross production of the former being nearly \$700,000, and the net profit \$350,000; while the production of the latter was \$325,000, the dividends paid during the year amounting to \$196,000. Several others of the principle companies operating at Cripple Creek have issued equally encouraging reports, and the outlook for the district seems good in spite of the diminishing



Map of Southwestern Colorado.

production due to the trouble from water on the deep levels of the big mines.

The completion of the new large mill at Colorado City, the numerous small cyanide mills that are operating, or in course of construction, and the lowered freight and treatment rates on ores all combine to stimulate the output of low-grade ore, and the year will probably close with a much larger tonnage than ever before, but of a slightly lower value.

Leadville continues active. A recent improvement is the beginning of sorting operations at the A. Y. & Minnie mine. The grade of ore required for the proper operation of the mill had become scarce, and in order to keep up the production, the simple arrangement of sorting the ore up to grade was adopted. This at the same time allows the removing of mineral that it is desirable to keep out of the mill, and materially improves the separation. Placer work in the vicinity of Leadville continues to attract attention, and at Twin Lakes and in California gulch operations are being carried on vigorously.

The speedy construction of a smelter at Lake City is promised and the intention is to start it before winter, if possible. It is expected to operate by pyrite smelting. The owners of properties producing low-grade copper ore are correspondingly encouraged. In this connection one is reminded of a smelting company that has begun con-

struction work in another part of the State. The prospectus sent out is exceedingly bare of details, but, as nearly as can be learned from it, the essential feature of the process is to be the use of oil for a fuel, instead of the usual coke.

The trial of the process seems to have consisted in reducing some iron ore in a small cupola furnace in a satisfactory manner. This would have convinced most metallurgists of its unsuitability for the treatment of lead or copper ores, but appears to have had just the opposite effect on the experimenters. The total cost of treatment by the new process is given as 45 cents, a statement that defies serious comment. The disadvantages of the use of oil as a fuel in the shaft furnace for any other purpose than melting the noses off tuyeres, are so well known that it seems incredible that investors should seriously take up any process that did not involve some new and promising method of obviating them.

Johannesburg, Transvaal.

Collapse of the Strike.—Contract System Suspended.—Reduction in Cost of Mining.—Loyalty of Staffs.—Gold Output.—Details of Production.

The house of cards is falling rapidly. Of course the strike-leaders talk grandiloquently of their cause, and the certainty of their being successful in the present dispute, but as a matter of fact the battle is practically won. One would think that the misguided strikers would turn and rend the idiotic leaders who have landed them in such a flasco, but the agitators continue to make their inflammatory speeches. Many of the strikers have gone back to work, and about the first thing they did was to resign from the miners' union.

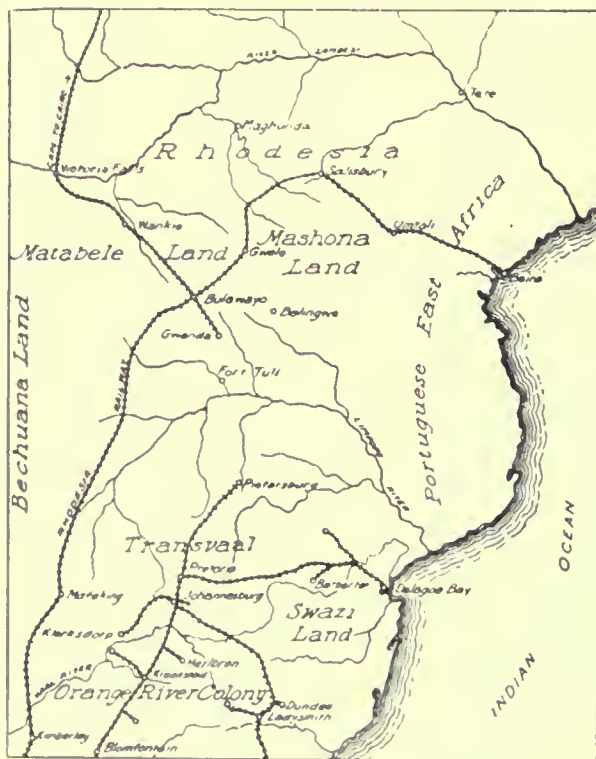
The men who left their work voluntarily are coming back under quite different conditions. In the first place, the contract system has ceased for the time being. Instead of making £50 to £60 superintending two rock-drills, the miner is being paid £1 per shift to run as many rock-drills as the mine foremen think he can watch—an average of four or five. The hand-stoppers who were earning from 28s. 6d. to 32s. 6d. per shift for superintending 30 to 35 natives or Chinese are now being signed on at 16s. 8d. per shift, to run as many natives as required, from 50 to 60. No reduction has been made in the pay of timbermen, pumpmen, etc., who still receive £1 per shift. The contract system is only suspended for the time being, and will no doubt be introduced again later on, but the days when a Cornishman, or American, or a miner from any part of the world, could make £100 per month in the mines is forever past on the Rand. In the future about £45 to £50 per month will probably be the maximum that an expert miner will be able to earn.

For months past there has been an agitation here on the subject of working costs. It was generally agreed that the inefficiency and high wages of the white miners had to be changed, but the problem was how to do it. Ten years would have been required to accomplish what the miners have done for the industry in six weeks. The pay would have come down, but it would have been a very gradual process. The strikers have given the leaders of the industry a great opportunity to start afresh. The reduction of the white wages bill will do much to approach the working costs of 16 to 17s. per ton, which Ross E. Browne in a masterly paper just read before a local society shows to be possible on the Rand.

At one of their mass meetings held at the beginning of the strike, the leaders told the men that the mills would be forced to close down soon after the strike was in full swing; monkeys would do the mining work quite as well as the raw white men that were being recruited

to work in the mines, declared the orators. Well, these monkeys are shaping remarkably well, and it must be a matter of the deepest humiliation to the band of strikers to see all the mills running, and to realize that their mad action has scarcely hung up any stamps. The staffs of the different mines deserve every credit for the loyal way they have stuck to their guns. Managers, samplers, surveyors, clerks, shift bosses, and mine captains have worked as miners during the past week, and have shown the greatest zeal in trying to keep the mills going. It must be remembered that the Kaffirs and Chinese now on the Rand are well trained, and do not require as much supervision as if they had just arrived on the mines. If for no other reason the strike of the miners was ill timed. Another fact which has helped us, is the refusal of the engine-drivers to join the underground men in striking.

The returns for the month of May show how little damage the strikers have done so far, as regards the out-



Map of the African Goldfields.

put. No doubt June will suffer much more. The total output for May was declared to be 524,477 oz., valued at £2,227,838. This shows a decrease of £53,272, or 12,542 oz., as compared with April. Of the total output for May, the Rand contributed 506,100 oz., while outside districts produced 18,377 oz. Although many of the mines show a decrease as regards the output of gold, still many of them will show record profits for May, on account of the reduced bill for white wages. This reduction will no doubt be a permanent one.

The Robinson mine takes first place for May, with an output of 23,449 oz.; next comes the Simmer & Jack with 20,649 oz.; then follows the Cason with 15,302 oz.; and fourth comes the Village Main Reef with 15,160 oz. On account of the desire to keep the mills going, the percentage sorted for the month shows a big decrease in some cases. True, the Princess Estate succeeded in keeping their 50 stamps at work, and sorting 10% at the same time, but on the large plants, which ordinarily sort from 18 to 20%, the amount of waste rock thrown out was only about 5 to 6%. On two mines there was no sorting at all. When conditions become normal there will be an increase in the sorting.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

A CUPEL 1½ in. diam., and weighing about 20 grams, is the size most commonly used in practice. The lead button to be cupelled in it should not weigh more than 20 grams.

ASSUMING that one pound of coke will yield 3,800 calories in the blast-furnace, since 3,325 calories of heat are required to flux one pound of silica, the coke required to do this work will be about 0.87 pound.

NORMAL SOLUTIONS contain in one litre the equivalent of one gram of hydrogen. Thus for acids or bases containing but a single replaceable hydrogen atom, the normal solution contains in one litre the molecular weight in grams.

SMELTER SLAG can be used to make a dam across a creek that is dry in summer, to hold water subsequently. This was done near Helena, Montana, a few years ago. Clay or cement should be used in the foundation to make the dam impervious.

AS DEFINED by the mineralogist, a crystal is the regular polyhedral form, bounded by smooth surfaces, which is assumed by a chemical compound, under the action of its intermolecular forces when passing, under suitable conditions, from the state of a liquid or gas to that of a solid.

IN INSTALLING a centrifugal pump to lift water from a river, care should be taken to place the pump as near the water as possible, with the suction pipe immersed in still water. Experiment has shown that if the in-take is in running water, the air in the riffle-water lessens the efficiency of the pump.

RESPECTING the relative merits of open and close-connected bucket-lines, it has been proved at most of the big dredging grounds in California that close-connected buckets may be used without serious trouble from operating causes, and that this arrangement is better adapted for the work than the open connection.

THE advantages of monolithic and reinforced concrete over all other forms of construction in foundations are seen in structures resting on yielding soils. The solid mass of concrete, as in a wall, tends to settle as a unit, and uniformly, even though the pressure may not be quite uniform on the entire foundation.

THE capacity of a bucket elevator depends upon the size of the buckets, the space between the buckets, and the speed of travel. The upper pulley generally drives the belt, receiving power from a side pulley, while the lower pulley should be hung in sliding boxes that can be moved by tension screws to tighten the belt.

Two drops of ammonia on a lump of sugar eaten immediately is considered a fair antidote for internal cyanide poisoning. This is usually the treatment when peroxide of hydrogen cannot be obtained promptly. In cases of external cyanide poisoning a warm bath containing bicarbonate of soda and common salt will allay the eruption.

THE British unit of heat, or the British thermal unit, is the quantity of heat required to raise the temperature of one pound of water 1° F. at or near the temperature

of maximum density, 39.1° F. The calorie is the French thermal unit, and is the quantity of heat required to raise the temperature of one pound of water 1° C. at or about 4° Centigrade.

THE load allowed on concrete piles should not exceed 20 tons per sq. ft. for those of large diameter. If there is any possibility of their acting as columns, as in the event of the surrounding earth being removed, the unit load should be less. Concrete is weak in columns, unless it is properly reinforced with steel. A better load on piles of small diameter is about 15 tons per square foot.

CAST-IRON pipes were formerly used for pumping under pressure underground, but are now rarely employed for this purpose. While cast iron is less subject to corrosion than either wrought iron or steel, the pipes are heavy and the sections difficult to handle. Wrought iron or steel pipe is almost universally used, an account of the less cost, greater security under water hammer, and greater facility in handling.

A CONCRETE with an angular coarse aggregate, such as broken stone, is stronger than one with a rounded aggregate, like gravel, although the rounded aggregate produces greater density, thus indicating a stronger adhesion of cement to broken stone than to gravel. However, if the sand is also angular, like screenings, the concrete with both rounded coarse and fine aggregate is the stronger, probably because of its greater density.

IN the Challenge feeder, which is really a variation of the Tullock feeder for stamp batteries, a circular cast-iron plate resting at an angle, is rotated beneath the hopper by a bevel gear, which, in turn, is moved by a friction arrangement varied by the blow received from the tappet on the stem, corresponding to the requirements of the stamp. At each partial rotation of the feed table a small quantity of ore is scraped off by the stationery wings resting on the plate.

CEMENT is being made from blast-furnace slag at several places in this country and abroad. Tests have demonstrated that it is of good quality, and for some purposes is equal to portland cement. It is manufactured by running the slag into water to granulate it, then drying below a dull red heat, pulverizing very fine, and mixing with 15 to 30% of dry, finely powdered, slaked lime. It is important that the slag should be thoroughly granulated in an excess of water, otherwise it possesses no hydraulic properties.

CAST STEEL is made by breaking blistered steel, or cutting bar iron into small pieces and melting it in combination with a small quantity of charcoal. When it is made from iron, manganese is mixed with it in close air-tight crucibles, from which it is poured into iron molds. The ingot is then reduced to a bar by hammering or rolling. Cast steel is the finest of steel and is known by a fine, even, close grain and a silvery and homogeneous fracture. It is brittle and acquires extreme hardness, but is difficult to weld without the use of flux. Other kinds of steel have a coarser grain and are less homogeneous, are softer, less brittle, and weld more easily. The best steel possesses the following characteristics: Heated to a redness and plunged into cold water it becomes hard enough to scratch glass and to resist the best files; the hardness is uniform throughout the piece. After being tempered it is not easily broken, welds readily, and does not crack or split. It bears a high heat and preserves capability of hardening after working; the grain is fine, even, and homogeneous.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

The Royal School of Mines.

The Editor:

Sir—Your London correspondent in his letter published in the issue of June 8, mentions certain happenings at the annual dinner of the Institution of Mining & Metallurgy, held on May 3, to which I desire to call attention. At this function the Rt. Hon. Reginald McKenna (President of the Board of Education) in responding to a toast, is reported to have said: "He was particularly happy in assuring the assembly that the new Imperial College of Science & Technology was on the verge of foundation." Among other bunkum and flattery with which this gentleman sought to feed the minds and elevate the souls of his auditors, he remarked: "The Royal School of Mines, which has created for itself a reputation extending the whole world over, would be affiliated with the new Imperial College." I infer from this official statement that the grand old Mining School has ended a long and honorable career at a time when its opportunities for extended usefulness were never greater and its good name and renown never more fully realized and appreciated abroad. It seems surprising to me that some old School of Mines man present, and there must have been a number, did not then and there enter his vigorous protest against this surprising and stupid indignity on the part of the Government. I sometimes think Englishmen lack sentiment, and when we hear of Lord Curzon begging, hat in hand, for funds to support the great University of Oxford, we may be pardoned the conclusion they are also deficient in pride. Is not the memory of Thomas Huxley, Dean of the Royal School of Mines, worthy of a better fate than this? We can imagine the discomfiture the Right Honorable gentleman would have received at Huxley's hands had he been present to hear this announcement. Why not consolidate the Royal Society, Geological Society, and Royal Academy into one organization, let Mr. Andrew Carnegie endow it, and call it the Imperial Carnegie Institute; that would have then made a complete job of the consolidation.

England's Empire does not need an Imperial brand, she is great and good because great men made her so, and similarly the Royal School of Mines is famous because famous men labored to build it up and to train some of the best mining engineers the world has ever had. Are not these traditions worth cherishing or are they to be forever blotted out by this Imperial humbug? I venture to think we Americans would never be guilty of such stupidity; we cannot make our great teachers dukes, lords, or Right Honorables, but we can and do hand down their names and memories to posterity in a fitting manner connected with the institutions they were instrumental in making great and worthy. Witness the endowment of chairs, scholarships, and funds in all our large universities. Had we the fortune to have possessed Huxley, Murchison, Smyth, Percy, Judd, and other great teachers less known to fame, I venture to assert an institution that such men had labored to create would never be extinguished by a parcel of politicians. Our political sins and lapses are not a few, but the canker of political scheming has seldom or never been permitted to affect our institutions of learning. Think what would happen should Congress propose to extinguish the the Smithsonian Institution by affiliation with, we will say, the Geological Survey (no reflection upon that excellent or-

ganization is intended). And it might be pertinent to ask in this connection why did Smithson, an Englishman of scientific attainments, come to America for an opportunity to found such an institution? Perhaps a similar reason now prompts an American to protest against the virtual extermination of the famous old English technical school in which he was once a student.

F. LYNWOOD GARRISON.

Los Angeles, July 10.

Cyanidation in the Transvaal.

The Editor:

Sir—We have read in your issue of June 8 some statements made by your Johannesburg correspondent in connection with our metallurgical innovations on the Rand which have considerably astonished us, and we trust that as you have circulated through your journal statements which are calculated to do us some harm you will grant us the use of your columns to rehabilitate ourselves in the eyes of your readers.

Your correspondent begins by stating that "several of the mines under our control spent thousands of pounds to install the process of circulating cyanide solutions advocated by the Denny brothers," and follows this with a quotation from the address of the Chairman of the New Goch Co. (on which mine we installed one of our plants), and an observation of his own that the Chairman's statement referred to "is rather disconcerting to the 'new metallurgy.'"

Before proceeding to deal with the Chairman's remarks on the subject of our process, we would like to point out that not a single pound was spent by us in the installation of the process for circulating cyanide solutions. We purposely built our plants so that in the event of our wishing to try the effect of circulating solutions they were as readily adapted for that as for our ordinary treatment without circulating cyanide solution, which we had installed at the Van Ryn mine, and which, we may add, is the system to which it is proposed now to revert at the New Goch. It would have been fair to us, more especially as we are not on the Witwatersrand, to reply to your correspondent's criticism, if he had stated that after all, the only portion of the plant that the Chairman of the New Goch found fault with was the system of circulating cyanide solution, and that the main principles of our plant, embodying tube-milling, automatic slime-treatment, and filter-pressing, remained as highly successful elements of the 'new metallurgy,' and constituting, of course, as the technical man knows, practically the whole of the 'new metallurgy.'

Coming now to the distinct feature of our system, which has been pronounced by the Chairman of the New Goch to have given rise to difficulties, we would observe that the test of the efficiency of a plant is high extraction coupled with low working cost. Neither of these claims are questioned by the Chairman, who clearly states that it is the intention to abandon the circulating cyanide solution method, merely because of the unreliable nature of the screen-assays, which had given rise to erroneous estimates of the gold to be expected at the monthly clean-up.

Adverting first to the efficiency of the plant, we may say, without any fear of contradiction, that the residue from the plant will not average more than from 1 to 6 grains, when in the former plant the average was from 18 to 24 gr. This result cannot be said to be unsatisfactory.

The assertion of the Chairman that the screen-assays have proved unreliable is one we can neither contradict nor confirm. In our complete paper, read before the

South African Association of Engineers, in June, 1906, we admitted the difficulties inherent in the practice of screen-sampling, when the sample itself is subjected to the solvent effects of weak cyanide solution; but we also pointed out very emphatically that the ordinary system of screen-sampling, and especially the usual method employed on the Rand, were open to even graver charges of contamination, which charges were not rebutted in the ensuing discussion.

As a matter of fact, we might mention that the screen-assay at the New Goch during several years of our experience, was as unreliable as it could possibly be, and we attributed it then, and now, to the fact that the ore of the mine contains unusually coarse particles of free gold, and therefore we do not believe that the abandonment of the circulating solution will overcome the difficulty, while we are certain that the working costs will be higher and the extractions lower. We make the last statement quite advisedly, because we ran the plant at the Meyer & Charlton mine (a plant the exact counterpart of the New Goch plant), first without cyanide solution, and carefully noted the results; and subsequently with cyanide solution in circulation, thus getting actual working figures for comparison. The important differences are given in our paper previously referred to.

What is the more inexplicable part of this change-over on the New Goch mine, is that with an exactly similar plant at the Meyer & Charlton, extraordinary success has been attained; which is attested by the fact that the manager of the mine, when showing the members of a scientific society over the plant at the end of last year, stated that the extraction up to that date, nearly a year after the plant had started running, was 95%. We may mention that with the former plant, our extractions averaged between 80 and 85% only, so that the new plant, according to the official statement of the manager, is responsible for 10% higher extraction, at an increased working cost of one shilling per ton; the net result being from 4 to 5s. per ton profit in favor of the new plant. Our estimate on which the plant was built was a net improvement of 4s. per ton in the profits.

It is interesting to observe that the chairman of the New Goch, who is also chairman of the Meyer & Charlton, stated in his annual address in 1907, when dealing with the operations for the past year, that "the larger profits resulting (from the year's work) have more than justified the expenditure occurred in the additions to, and improvement of, the plant." He further stated that "the company had produced more gold and earned a larger profit than in any previous year," the actual figures being with the old plant for 1905 a gross profit of £99,784, and with the new for the year 1906 a gross profit of £136,967, or an increase of over 36 per cent.

The question now arises why, with the Meyer & Charlton plant, such magnificent results have been secured, and why at the New Goch they have been so disappointing as to give rise to the criticisms and damning statements of your correspondent.

We are in position to say that during the time we were in control of the plants, we made complete clean-ups of the new Meyer & Charlton plant, first, to satisfy ourselves that the gold called for, as between the screen-assays, and the residue-assays, was in the plant, and subsequently, at the instance of the Chairman of the company, on more than one occasion, to satisfy his doubt on the matter. The clean-up was in each case a complete vindication of our methods, as we had in each case a plus extraction. In the face of these results, and of the actual record of the Meyer & Charlton with its new plant, for 1906, we think that you must agree that your correspond-

ent's strictures, and his concluding observation that "it is fortunate for the rest of the Rand that conservative counsels prevailed, and that the mines of other groups did not take up the metalliferous schemes so persistently promulgated by the Messrs. Denny," are unfair. It is rather unfortunate for your correspondent that this final statement should, in any case, so inaccurately represent the actual situation.

We were solely responsible for the introduction of tube-mills, and the leading, if not the only, advocates, for fine-grinding, and secondary amalgamation. Our principles have been accepted and a plant to carry them out has been installed on every up-to-date mine on the fields. We are again solely responsible for the introduction of filter-presses to the Rand. Slowly, but surely, these appliances are being installed, and no less than five big mines are at the moment putting them in. We are solely responsible for the introduction to the Rand of a new form of mortar-box, in which the water-feed is delivered through the back of the box, at about the level of the die. We learn from the consulting metallurgist to the leading group on the field, that the same method has been adopted by them with the greatest success.

In conclusion, we would say that when the whole cause of dissatisfaction with our plant is boiled down it merely refers to the fact that on a particular mine, disappointments in the gold yield have been experienced, which on that particular mine, is no new thing. We assert without any fear of contradiction, that the only other mine on which we installed a plant, where the disappointments indicated have never existed, a complete clean-up of the plant has always shown rather more gold than the screen-assay called for. The reversion to the so-called decantation system about which the Chairman of the New Goch and your correspondent have both made so much, does not invalidate one single principle of our scheme, nor cause the slightest alteration to our plants, other than the substitution of water for weak cyanide solution, and a dam for receiving the slime and solution from our specially designed slime-plants, which latter, as a matter of fact, we provided before the plant was started.

The whole of the details of this scheme we worked out, and successfully practised at the Van Ryn mine, with an equipment of 160 stamps. We are sorry that an explanation of the true position in connection with our plant has necessitated so much space, but we believe it to be due to our friends and ourselves to state the position fully and clearly.

DENNY BROS.,
Per G. A. DENNY.

London, June 27.

CANADIAN EXPORT TAX ON IRON ORE.—Premier McBride has made the important announcement that at the next session of the British Columbia legislature, to be held in February, 1908, the Government will pass legislation restricting the export of iron ore from British Columbia to the United States or other foreign countries. He stated that capitalists resident in the United States had acquired large holdings of iron ore in the province with the avowed intention of shipping the same to the United States to be used in smelting works there. A large export tax will be placed on ore shipped outside of Canada, which would be remitted when ore was smelted in the province. He referred to the vast beds of iron in Vancouver island which have been acquired by American capitalists for use in smelters in process of erection near Port Townsend. It is intimated that the effect of this warning may result in the erection of smelting works on Vancouver island, especially if the Dominion Government grants a bounty therefor.

Working Costs on the Rand and Comparisons With Mines in California.

By ROSS E. BROWNE.

*During a sojourn of 20 months on the Rand, from January, 1904, to September, 1905, I had occasion to collect information on the subject of working costs. My employers, while not responsible for my views, have authorized the publication of my text on the above subject, hoping that discussion may bring out the *true* situation and clear the field to some extent for systematic consideration of measures designed to reduce the prevailing high costs.

The term 'working cost' will be adopted as referring to the running expense of the fully equipped mine. It includes the cost of developing, extracting, and treating the ore, and all attendant expenses of management, but

The subsidiary companies of the corporation known as Rand Mines, Ltd., have based their accounts in the main upon the above conception; yet the large cost of development prior to the date of milling was charged to capital account and is not redeemed out of the yield. It would have been more in accord with the principle stated to maintain for this purpose a suspense account for gradual distribution, but the complication was unnecessary and was therefore avoided. These companies charge to working cost the actual expense of development during the current year, irrespective of any close correspondence between the number of tons developed and the number mined. In the yearly total for the nine mines the discrepancy is small. The running capital account is small and apparently well controlled.

Many other companies on the Rand adopt a fixed development redemption charge per ton of ore milled—a charge



On the Rand. Simmer & Jack. No. 2 Shaft.

excludes the cost of shaft-sinking down to the lode and all original equipment.

Assume a simple case. The mine has been opened by means of vertical shafts down to the lode. Full surface and shaft equipment have been provided for operation on the basis of a fixed stamping capacity. The ore is to be mined and treated as fast as developed. Then the total cost to date is 'capital expenditure,' and the expense henceforth is 'working cost.'

But few mines are fully equipped in the beginning, and development commonly precedes the operation of stopping. We must then maintain a running capital account and a suspense account. Definitions vary, and we seldom find a consistent line drawn between 'capital expense' and 'working cost.' The distribution of expenses is left to the discretion of managers and secretarial staffs. It is commonly understood that there should be charged to working costs all current expenses excepting those that are incurred in providing for an increased capacity of the works. The expenses of repairs, renewals, and replacements are included.

which seldom corresponds closely to the actual cost. There is a wide variation in the percentage of waste sorted out of the rock mined and delivered to the surface—varying from 5 to 35%. As the working costs are calculated per ton milled the figures thus furnished are not directly comparable. The records of tons mined and tons milled are often unreliable within 5 or 10%; and the tonnage developed is, within certain limits, a matter of estimate.

It is apparent that the working costs per ton of ore, as usually published, are not based upon common measures, and for comprehensive comparison there is required a uniform system of distributing the expenses and close scrutiny of the details. It is customary on the Rand to record many statistics, and with these in hand we may generally get at some reasonable basis for comparison by taking the necessary pains.

Roughly, the average yield of the Witwatersrand at the present time (September, 1905) is 35.7s. per ton of ore milled. The working cost is 21s*. The capital expenditure, if systematically redeemed out of the yield, would mean a charge of about 5s. per ton. The tax im-

*Abstract of paper read before the South African Association of Engineers, on June 1, 1907.

*A shilling is equal roughly to 24 cents.

posed by the Government is 10% of the profit. We thus have for the average case :

Working cost.....	21.0	shillings	per ton milled
Capital redemption.....	6.0	"	"
Total expense.....	29.0	"	"
Yield.....	35.7	"	"
Profit.....	6.7	"	"
Profit tax.....	0.7	"	"
Company's profit.....	6.0	"	"

This is a crude estimate ; a close calculation would involve an examination of all accounts in detail, which has not been attempted.

The nine producing companies of the Rand Mines, under the general management of George E. Webber, keep comprehensive accounts, affording good facilities for analysis. These are the Glen Deep, Rose Deep, Geldenhuis Deep, Jumpers Deep, Nourse Deep, Ferreira Deep, Crown Deep, Langlaagte Deep, and Durban Roodepoort Deep—all representing 'deep level' mines of moderate depth—average about 1,200 ft. vertical. They are scattered along the length of the main producing area, and in the aggregate fairly represent the conditions of the Witwatersrand. The equipment is more modern than the average, and the working costs are somewhat lower, though not the lowest. It is proposed to use these accounts to represent the modern practice.

There are a number of causes of variation in cost. The most important of these is the number of stamps operating. However, in cases of exceptional deviation from the normal type other causes may become equally or even more important. Thus the Nourse Deep costs are excessive owing mainly to the abnormally faulted condition of the ground. The Rose Deep costs are low owing to the great width of stoping. The stopes of the Rose Deep have recently narrowed down and the cost per ton has risen. The other mines of the group show persistent decrease of cost per ton, with increase of the number of stamps operating. By doubling the number of stamps the working costs per ton of ore is reduced by 10 or 15 per cent.

The following figures refer to the normal type of mine, and while extending beyond the limit of experience, they are still deemed to represent fairly the present conditions :

Number of stamps operating.....	100	200	300	400
Working cost per ton milled (shillings).....	21.8	19.0	17.7	16.8

By way of summary it may be stated that with 1,200 ft. depth of mining, 5.75 ft. width of stoping, 13% sorting, and 110 stamps running, the working costs per ton of ore milled are :

In mining, including development.....	14.00	shillings.
In milling.....	2.82	"
In cyaniding.....	2.64	"
In management and general expense.....	1.81	"
Total.....	21.27	"

These figures appear high in comparison with the costs of economically worked gold mines elsewhere. What are the controlling causes?

There are available the accounts of various gold mines in America. These show wide variations in width of stoping, hardness of the rock, and treatment of the ores, and fair criteria for estimating the relative efficiency of work are difficult to obtain. The data are incomplete, in fact, the bulk of the information serves only to illustrate the futility of attempting comparisons without various elements of parallelism in the conditions and personal examination of details.

Two California mines were specially selected for comparison on account of similarities in depth of mining and width of stoping, the comprehensive character of the accounts, and my own familiarity with local conditions. These are the Oneida mine on the Mother Lode, and the

Empire mine at Grass Valley. These are among the better managed mines of the West. In connection with the Oneida, the necessity for economy is apparent from the low yield.

COMPARATIVE TABLE.

	Rand.	Oneida.	Empire.
Average vertical depth of mining (ft.).....	1,200	1,600	1,000
Number of stamps erected.....	131	60	40
Cost of plant (equipment) (£).....	425,000	50,540	45,400
Per stamp (£).....	3,244	840	1,132
Percentage of assay value actually recovered.....			
By free amalgamation.....	55	61	77
By cyanidation.....	34	—	—
By concentration.....	—	26	14
Total.....	89	87	91
Average width of stopes (in.).....	69	71	48
Tons of ore developed per month.....	16,000	10,000	4,000
Tons of ore mined per month.....	17,779	7,640	3,090
Percentage sorted out as waste.....	13.16	—	—
Tons of ore milled per month.....	15,654	7,640	3,090
Average number of stamps running.....	111	54	40
Number of days run per month.....	29.00	29.75	900
Weight of stamp (lb.).....	1,137	1,050	—
Average duty of stamp per 24 hours (tons).....	4.85	4.78	2.53
Average dip of lode or vein.....	30°	65°	28°
Yield per ton milled (shillings).....	36.5	14.0	—
Mine water pumped (Imperial gal.).....			
Per 24 hours.....	163,149	58,408	750,000
Per ton milled.....	303	226	7,500
Percentage of ore cyanided.....	100	—	—
Percentage of concentrate produced.....	—	1.4	—
Percentage of sulphides in ore.....	2.5	1.5	2.4

In obtaining a basis for comparison of costs there are to be considered primarily the *natural* advantages and disadvantages as distinguished from those *artificially* established by man. The representative Rand mine has thus the advantages of two payable lodes in close proximity, each of fair stoping width, and furnishing a relatively large amount of ore over wide areas, also a remarkable stability in the walls of its openings. Its disadvantages are in the hardness of the rock, the flat dip of the lode necessitating expensive handling in the stopes, the necessarily high cost of water and treatment.

The Oneida has the advantages of softer ground for mining, steeper dip of vein, cheap water-supply, and simpler treatment of the ore. Its disadvantages are limited supply of pay-ore in one vein only, and instability of the walls of its drifts and stopes, necessitating expensive timbering.

The Empire has the advantages of cheap water-supply, both for battery use and power, and simple treatment of the ore. Its disadvantages are hard rock, limited supply of ore, narrow stoping width, flat dip of vein, instability of the hanging wall, and a large amount of underground water.

The working costs, in shillings per ton of ore milled, are as follows:

Rand Mine: 21.27. Oneida: 10.93. Empire: 18.73.

But these are not upon a common basis, since the Rand mine sorts out a portion of the waste from the rock mined and hoisted before milling, and the proportion of rock developed was not the same. Taking these matters into account the costs are:

Rand: 19.63. Oneida: 10.67. Empire: 18.03.

The effect of differences in natural conditions is at once apparent in comparing the Oneida with the Empire, where the costs are widely divergent, while the labor methods and efficiency of management are practically the same.

The ratios of the numbers of tons mined per month are about 5:2.5:1. If the California mines furnished ore enough to justify the stamping capacity of the Rand mine, the costs would probably be:

Rand: 19.63. Oneida less than 10. Empire less than 15.

The stoping widths are:

Rand: 69 inches. Oneida: 71. Empire: 48.

If the Empire width were increased to 69 there would result a further reduction in its costs.

The most significant consideration concerns the number of men employed per ton of ore. The numbers per comparison ton are about as follows:

Rand: 1.95. Oneida: 0.54. Empire: 1.

With similar stamping capacities the numbers would probably be as 1.95:0.5:0.8.

The Rand figures are based on accounts prior to importation of Chinese labor. Since then the numbers have greatly increased, and it is probable that a comparison with the California mines at the present time would show that the Rand mine is employing fully four times the number of men per ton of ore.

But all these figures require radical modification before any measure of efficiency can be inferred from them, as the appendices to my report will indicate.

Comparing the Rand with the Mother Lode, a much higher cost is legitimately due to the greater hardness of the rock and the necessary treatment of the ore. This is partly, but not fully, balanced by the stability of the walls of the openings and the exceptional continuity of pay.

Comparing the Rand with Grass Valley, the *natural* conditions, so far as they concern working costs, are on the whole favorable to the Rand.

In order to obtain some measure of the efficiency of the work a series of estimates have been attempted on the basis of the data in hand. The results reduced to the basis of 100 stamps are given in the following table:

1. Present working cost per ton milled.....	22 shillings
2. Substituting California labor, wages, cost of supplies, economy of management, etc.....	17 "
3. Under the most favorable conditions, with efficient skilled white labor and white direction of colored labor, reduced cost of supplies, etc.....	15 "
4. With efficient labor, exclusively white, present white wages, present cost of supplies, etc.....	26 "
5. With present white labor, and substitution of available white for the present colored labor—maintaining present average white wage, cost of supplies, etc.—a reliable estimate cannot be made, but the figure would probably exceed.....	35 "

REDUCTION OF COSTS.

The significance of a speedy reduction of the average working costs of the Rand, from 24s. to say 16s per ton, is apparent from several different standpoints. To the shareholders of the operating mines it means doubling the dividends. To the owners of undeveloped properties it means a great increase of present value. To the community at large it means a great increase in the output and a rapid rise in prosperity. There is a vast area that can only be rendered payable by the reduction of costs. The present operating mines would add materially to their stamping capacities, and many new enterprises would be inaugurated. A large portion of the gross production, probably exceeding two-thirds, passes through the hands of the local community.

The fact must be recognized that whereas the Witwatersrand contains, in a comparatively small territory, a greater quantity of gold than was ever known to exist elsewhere in an equal area, the average grade of the ore is low. In the first working the higher grade ores were particularly sought, and the yield per ton is naturally and inevitably diminishing. Unless something is done to reduce the high cost, the greater part of the value will be lost to the present generation, and much of the ground will be botched for further working.

One occasionally hears the statement made that the low-grade ores will "keep," and may be worked later on when the absolute necessity for lower costs is forced upon us or our successors. Without conceding the desirability of leaving the better development of the industry to our successors, we may admit the truth of this statement in so far as it concerns undeveloped territory, but it is fallacious if applied to the present working mines.

In the average operating mine of the Rand the masses of ore yielding less than 22s. or 23s. must now be left behind. In the course of time the mine will be dismantled and left to cave—many of the older workings are already caving. The re-opening and rehabilitation of the mine will be costly, and it will be worked at a disadvantage, if at all. It is safe to say that reducing the cost to 16s. today would mean, aside from the incomparably greater profit, a greater ultimate production than reducing to the same figure 10 years hence.

But no one acquainted with the facts will seriously deny that the immediate interests of the industry demand a radical reduction of the costs. The question is: How shall the reduction be brought about?

As long as we confine ourselves to the methods of prospecting, testing, and developing the lodes, and to the character of the machinery, buildings, and appliances, we may say that the engineering work has been excellent. Where the engineer has failed in his attempt to produce good results has been in the handling of the labor. That much of the present labor, especially underground, is deplorably inefficient is generally conceded. It is understood that efforts have been made from time to time to establish a reasonable standard of a day's work, but that the many economic and political obstacles in the way have been discouraging and often insurmountable. The Transvaal has been in a state of political turmoil, rendering impracticable many of the proposed measures of economy.

Among the many considerations involved in a reduction of costs, the one of primary importance is a positive improvement in the efficiency of the labor. Many suggestions have been made. It has been proposed to introduce the conditions of America and Australia, and to operate the mines exclusively with whites. But it would be impossible to provide efficient white labor in the large numbers required, in reasonable time, and unless the conditions were so radically changed as to permit of a much lower wage than now prevails, the cost, however efficient the labor, would be higher than at present. It has also been proposed to displace part of the colored labor with unskilled white labor, providing a wage intermediate between that of the Kaffir and that of the skilled white. The changes involved are generally regarded as wholly impracticable. South Africa, with its preponderating numbers of blacks, is not the country for cheap white labor. The black man is there to stay, and must be dealt with. He must be controlled, and efficiency of control demands utilization of his work. The assignment of similar work to whites and blacks would result in lowering the standard for each, and breaking down the barriers that are essential to the supremacy of the white race. A distinct line of separation in the duties of skilled white and unskilled colored labor is of paramount importance. Fortunately for the mining industry this division of labor, with efficiency on both sides of the line, will lead to the best possible results. This is doubtless generally conceded by those most familiar with the work.

It is furthermore only in this way that a high average wage of unskilled labor can be maintained, and a desirable status for the white man can be upheld.

The value of the Kaffir labor under reasonably efficient direction is well recognized, and the economy is somewhat strikingly exhibited in the low cost of coal mining on the Rand. Coal mining is incomparably simpler than gold mining (including treatment of ore) and calls for a much smaller proportion of skilled labor. The illustration is nevertheless significant. In the presence of the low cost of coal mining, the high cost of gold mining is clearly attributable to the inefficiency of the skilled labor,

either directly or in its supervision of colored labor. From the various considerations involved it is quite manifest that under existing conditions, or any conditions that may reasonably be expected, the colored labor is of vital importance to the working of the Rand mines.

It is believed that machine-drilling under proper supervision is the proper thing for the Rand. Generally

lower. Under the most favorable conditions it is plainly possible to lower the cost to 14s. without materially reducing the high average white wage now prevailing. A high wage is desirable for many reasons, but is not feasible without return of efficient service.

COPPER IN WYOMING.—North and east of North



Looking North Across Open Pit of Treadwell Mine.

speaking the rock is too hard for economical hand-drilling. The substitution means a decrease in the ratio of colored to white labor. My view regarding the required ratio has gradually undergone modification, and

Platte river in east-central Wyoming is a broad, low, domal mountain mass, with a maximum height of about 6,000 ft. above sea level, which is known as the Hartville uplift and which is similar in many respects to the



Open Pit of Treadwell Mine, Showing the Orebody.

it appears to me now that the ultimate ratio will be less than 7 to 1.

An improvement means necessarily a material reduction in the number of men, white and colored, per stamp—a reduction that should, however, be met by the increase of stamping capacity required for best results. Regarding this increase of stamping capacity, if the average number of stamps were double the present number, the working cost would doubtless be 10 or 15%

Black Hills of South Dakota. Throughout this entire area copper is so widely distributed that, although no large deposit has yet been discovered, valuable beds of ore may at any time be found. The ore deposits occur in the form of fissure veins, lenticular or globular masses of ore that outcrop at the surface and pinch at slight depths, and blanket or bedded deposits. The fissure veins have not been sufficiently developed to establish their character beyond doubt.

The Treadwell Group of Mines.

By ARTHUR C. SPENCER.

*The mines of this group are owned by the Alaska-Treadwell Gold Mining Co., the Alaska-Mexican Gold Mining Co., and the Alaska-United Gold Mining Co. The mines, four in number, are known as the Treadwell, Seven Hundred Foot, Mexican, and Ready Bullion. The Seven Hundred Foot and the Ready Bullion are owned by the Alaska-United Co., though the former is leased by them to the Treadwell company.

These mines are situated on the inland side of Douglas island, near the shore of Gastineau channel, along which the workings extend for a distance of nearly 7,000 ft. The northwesternmost mine is the Treadwell, and southeastward through the Seven Hundred Foot and Mexican properties the strike of the lode is continuous for a distance of 3,600 ft., beyond which there is an unexplored interval of 2,300 ft. between the Mexican and Ready Bullion.

Although the mining operations have revealed several separate orebodies and certain distinctions are made in the character and occurrence of the ores, the mines are all situated on the same lode and the ore is practically of identical origin throughout.

The mines of this group have yielded \$24,817,000 from

oblique to the channel, so that the outcrops of the orebodies recede from the shore as they are followed northwest. The base of the greenstone hanging wall strikes the shore of the island about one mile below the Ready Bullion mine, at first running inland and then back to a point below high water just beyond the exposure of the southernmost body of diorite in the open pits of the Ready Bullion mine. Reappearing within a few hundred feet, it bends sharply and is next exposed in the southeast pits of the Mexican mine. From this point it is traceable in a nearly straight line through the Seven Hundred Foot and Treadwell workings and for a distance of several miles beyond.

In the vicinity of the mines there are no dikes of diorite on the south side of the greenstone next to the channel, but about one mile to the northwest two croppings have been noted, and Juneau island, lying in Gastineau channel about 2,000 ft. from the foot-wall, is composed in part of similar rock, which contains some pyrite impregnations. Farther to the northwest dikes of mineralized rock apparently originally similar to this diorite are found in the vicinity of Cowee creek, where they also lie above the bed of greenstone.

Besides the mineralization in the igneous dikes, the black slate that lies on either side of the greenstone band contains occasional veins and stringer leads at several



Douglas Island, Alaska.

1882 to the end of 1905, and of this total \$17,359,811 is to be credited to the Alaska-Treadwell alone.

The Treadwell orebodies consist mainly of mineralized albite-diorite occurring in the form of intrusive dikes in black slate, the structure of which they closely follow. These slates are metamorphosed shale in which both bedding and slaty structure strike northwest-southeast and dip about 50° toward the northeast. The ore-bearing dikes belong to a series of intrusives that appear interruptedly along the strike for a distance of about three miles in a zone approximately 3,000 ft. wide. In the greater part of this intruded area exposures are few, and only small dikes are found outcropping on the side toward the centre of the island. On this side the zone seems to be irregularly limited, but next to the shore of Gastineau channel the border is defined by a heavy bed of greenstone that runs parallel with the slate and the intrusive dikes and dips with them toward the adjacent channel. Outside of this greenstone no dikes of diorite are known near the mines, though they do occur toward the northwest.

The mineralized dikes that constitute the ore occur just beneath the bed of greenstone, which thus constitutes the hanging wall both of the intrusion zone and of the orebodies. Many of the dikes of albite-diorite at a distance from the hanging wall have been greatly altered and impregnated with pyrite, though workable orebodies have not yet been discovered in them.

The strike of the different rocks is regular and slightly

points. In general these veins follow the structure of the slate. Veining of this sort may be readily observed along the shore of the island southeast of Ready Bullion creek, and it is particularly to be noted along the foot-wall of the Treadwell greenstone for a distance of several miles northwest of the mines. Assays of material taken from these veins by the writer showed values up to \$6 per ton. There has been no systematic attempt to develop them at any point, and it is doubtful whether the ore is segregated to an extent sufficient to make them profitable.

The hanging-wall greenstone forms a prominent bed about 300 ft. thick. It follows the structure of the slate. As a rule the rock is greatly altered and in places it is often schistose or slaty, but portions of it are sufficiently unchanged to indicate the original composition and structure. In the vicinity of the Ready Bullion mine the rock is granular, consisting mainly of coarsely crystallized hornblende, though it contains a great deal of magnetite and some pyrite. Northwest of the workings the greenstone is a fine-grained diabase.

The greenstone was called gabbro by Becker, who regarded it as later than the rock of the orebodies, but there is now sufficient evidence to establish the opposite age relation, and reasons exist for doubting its intrusive nature. In the open pits of the Seven Hundred Foot and Mexican mines the exposed lower part of the greenstone bed is very schistose, and this slaty rock forms both walls of the orebody. Between the ore and the black slate, which usually forms the foot-wall, is a plate or layer of

* Abstracted from "The Juneau Gold Belt, Alaska," Bulletin No. 287, U. S. Geological Survey.

chloritic schist of variable thickness, evidently identical with the schistose greenstone of the immediate hanging wall, and the latter grades off into the massive rock. This relation suggests that the locally developed schistosity of the greenstone existed before the intrusion of the diorite dikes, or was produced at the time of the diorite invasion, and in either case the greenstone must be the older rock.

The black slate, which constitutes the main country rock in the vicinity of the Treadwell mines, is a highly metamorphosed, carbonaceous, and calcareous shale of fairly uniform texture. The stratification is usually determinable from variations in color and from slight changes in the character of material, and so far as observed the bedding and principal slaty cleavage are always in accord. The cleavage of the slate is regarded as having been produced before the diorite intrusions, the direction of which it largely controls.

Classification of the Treadwell diorite is difficult, because it has been impossible to secure unaltered material. It was described as granite by Adams, but Becker gave it the designation 'sodium syenite,' to distinguish it from the ordinary syenites, which contain potassium as their alkali constituent. However, since the soda-feldspar albite, which is the characteristic mineral of the rock, belongs to the plagioclase series, and these feldspars are the distinguishing feature of dioritic rocks, he suggested the alternative name 'albite-diorite,' which is here employed, because it indicates the known relationship of the Treadwell rock with the dioritic intrusives of the adjacent Coast range.

In the vicinity of the mines dikes of albite-diorite occur in the black slate and are distributed throughout a zone about 3,000 ft. wide extending along the strike for a distance of three miles. Thus far only bodies near the hanging wall of this zone have been mined, though several others are strongly mineralized. The dimensions of the different dikes are extremely variable, the larger ones having a maximum observed width of over 200 ft. in surface exposure and in the mine workings. The sizes vary from this down to the width of one's hand. Toward the ends of the intrusive area only small dikes occur, as may be observed along the bed of Bullion creek.

The occurrence of the sulphide-bearing diorite that forms the Treadwell ore deposit has been described by G. M. Dawson, who visited the mine in 1889. This geologist states his impression that the deposit represents the upper portion or 'feather edge' of a granitic intrusion, probably contemporaneous and connected with the granites of the neighboring Coast range. The structural relations presented by this view are entirely in accord with present observations, for, while the rock cannot be strictly classed as granite, neither can a large part of the rocks which form the core of the Coast range be so classed, since their composition is usually dioritic.

In several places in the mine basalt dikes, which cut all the other rocks, have been encountered. They are narrow, usually from a few inches up to three feet, and have sharply defined walls. Locally the dikes occur in pairs, and in several places are seen to divide, particularly when they occur in zones of sheeted rock. The fissures in which they occur are transverse to the strike of the rocks and trend from N 10° W to about north and south true meridian, with a rather steep dip west. As a rule, they are not mineralized, though a small amount of pyrite sometimes appears. In several places veinlets of calcite occur along the selvage, but these are readily determinable as of later origin than the greater part of the quartz and calcite that form a reticulation throughout the mass of the ore material.

The occurrence of the albite-diorite dikes constituting the Treadwell orebodies has already been described.

The ore consists mainly of rock impregnated with sulphides, principally pyrite, and in part shattered and filled by reticulating veins of calcite and quartz, which also carry sulphides. The ore-bearing dikes are considerably mineralized throughout, and often the whole mass can be mined. Locally, however, the rock is too poor for extraction, and portions of it must be left.

Three sorts of ore are recognized by the miners—'quartz,' 'brown ore,' and 'mixed ore.' The quartz ore, which constitutes the bulk of the workable material, is essentially altered and mineralized diorite cut by a network of small veins of quartz and calcite. As a rule, its color is white or light gray, but in many places it has a greenish cast. The brown ore is derived from a comparatively small amount of productive mineralization occurring in the walls or in the narrow horses of slate, where the presence of gold-bearing sulphides is commonly recognized by a brown color. The brown material grades into the ordinary black slate, and its color is apparently due to decarbonization of the carbonaceous rock by percolating sulphide solutions. Impregnation of the slate is by no means always present, and where it occurs it seldom extends for more than 2 or 3 ft. from the walls of the main ore mass. The mixed ore, which is more abundant than the brown, is composed of slate intricately intruded by small dikes of very fine-grained diorite, the whole being impregnated with sulphides in the same way as the ordinary ore.

The value of the material mined varies from \$1 to \$5 and even \$10 or more per ton, though in the course of development a great deal of less valuable rock is extracted, and in working the open pits large amounts of worthless slate must be moved, much of which goes with the ore to the stamps. In general the average value of the rock has been a few cents over \$2 for the past two or three years. From 60 to 75% of the gold is free milling, and the concentrate, which the mill records shows to be about 2% of the material treated, assays from \$30 to \$50 per ton.

The impregnation of the dikes in which the ore occurs is, for the most part, so general and the presence of at least small amounts of gold is so constant that it is impossible to recognize any well-defined masses properly distinguishable as ore-shoots, though the gold is by no means uniformly distributed. From the assay-plan the gold does not appear to occur in any regular way, and indeed the distinction between ore and rock too lean to pay for extraction is often the matter of only a few cents. The actual differences in the tenor of several contiguous samples taken are usually much greater than the difference between the average of any block of ore and the contents of intervening masses of poor rock. In several places mere joints or seams may be noted separating the ore and the poor material, and it frequently happens that blocks of the latter, which assay from a trace up to \$1, are entirely surrounded by ore averaging \$2 or more. Structural limitations, such as joints, however, are difficult of observation, because the sides of the drifts are everywhere covered with dust.

In general the best ore is that which contains the greatest number of quartz and calcite veinlets, and though their absence is not an infallible indication of valueless material, it seems that the irregular distribution of the gold has resulted mainly from original differences in the amount of crushing and the consequent varying permeability of the rock. Where there is no metasomatic replacement of the diorite by secondary albite, the sulphides usually replace such minerals as hornblende or mica, and it is suspected that in these cases the gold content is ordinarily low.

In planning the position of stopes the assay-charts

often indicate pillars of relatively poor material, but as a rule the poor rock is not found to persist for the whole distance between two levels. The largest masses, which have been left because of their leanness, are on the foot-wall side of the south dike in the Treadwell workings,

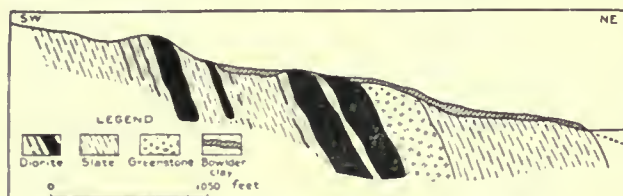


Fig. 1. Cross-section Through Alaska-Treadwell Mine and Northern Side of Douglas Island.

but even here there are great variations in the gold tenor at different places. On the 110-ft. level all the rock was minable; on the 220-ft. level from 10 to 40 ft. of low-grade stuff was left on the floor, excepting for a distance of about 150 ft. On the 330-ft. level good ore was found up to the slate, excepting for 200 ft. along the west

an apparent gradation from the vein-matter into the wall-rock. In small specimens it is often difficult to distinguish the vein-stuff from the rock when the amount of introduced minerals is large in proportion to the mass of the matrix, though in large fragments or on the stope faces the general extent of the different portions of the ore is exhibited. The microscope shows that the merging of the veinlets with the rock cut by them is due either to penetration of the latter by calcite, which is intercrystallized with secondary albite formed at the expense of the original feldspar, or, in the case of some of the smaller veins, to the fact that albite formed in the vein or along the side of the fractures is intergrown with the feldspar of the rock, making a closely welded boundary.

In the minute veinlets quartz seldom occurs, the filling being albite with some calcite, pyrite, and occasional rutile. Where it fills narrow cracks the appearance of the albite mosaic and the manner in which it comes in contact with the walls suggest that it may have been formed by granulation of the original feldspar. To what extent this suggestion may apply cannot be determined,

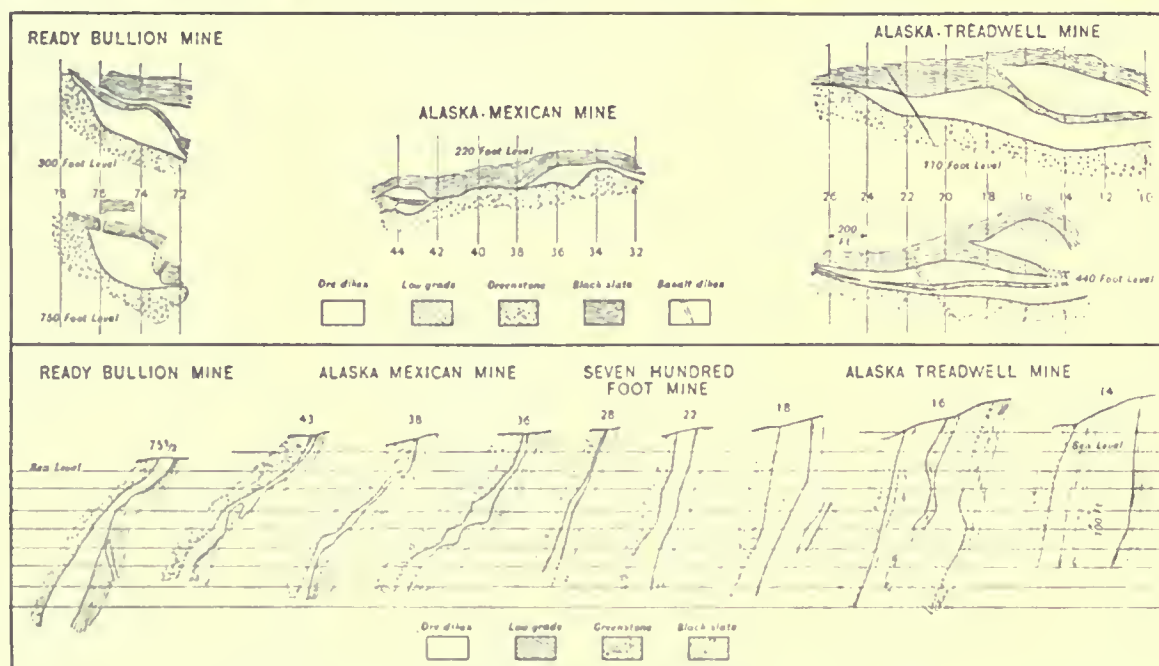


Fig. 2. Plans and Cross-sections of Orebodies in Mines of Treadwell Group.

end, where 20 ft. or so was left; while on the 440-ft. level not over half the rock assayed over \$1. The relative position of the high-grade and low-grade material in this part of the mine is shown in the plan of the 440-ft. level and in section 16 (Fig. 2).

In almost all parts of the Treadwell deposit reticulating veinlets of calcite and quartz are prominent features of the mineralized dikes. Aside from a small amount of sulphides, the veinlets are often composed entirely of calcite, but this mineral is usually accompanied by quartz, though the latter seldom occurs by itself. Albite has been noted only in fillings that are less than an inch in width, though there is every reason to believe that careful search would reveal it in small amounts in many of the larger stringers. The veinlets rarely measure more than a few inches across, while many of them are much narrower. The microscope shows the presence of minute fracturing between the veins visible to the unaided eye. The veins are usually closely spaced, and an estimate based on a study of all the mine workings indicates that infiltrated materials make up nearly one-fifth of the mass of the ore.

The boundaries of the veinlets against the inclosing rock are sometimes distinct, but in many cases there is

but it is to be noted that the calcite and pyrite of the mineralized rock never penetrate the clouded feldspars, but are always confined to these mosaics except in portions of the ore where hornblende has been replaced by sulphide. The presence of calcite and pyrite shows that there has been an introduction of material during the formation of the ore, so it may be that part of the feldspar substance was found ready at hand, while another part of it has been contributed by the mineralizing waters.

Veinlets traverse the rock in different directions, but the greater part of the filling occurs in fissures constituting two well-marked systems. One set of fractures strikes and dips approximately with the structure of the inclosing slates; the other, which is the more prominent, strikes slightly oblique to the structure of the country rocks and dips in the opposite direction—that is, toward the southwest. The fractures in the diorite have been so completely healed by the combined replacement of the rock minerals and by the deposition of vein-stuff that in blasting the ore breaks like a massive rock.

The ore dikes have been developed along the dip for a distance of approximately 1,000 ft. in all three of the mines now operated. The Treadwell workings reach

about 700 ft. below sea-level, the Mexican 600 ft., and the Ready Bullion 800 ft. In no case has it been possible to make out any progressive change in the character of the ore as depth was attained. The assay-charts show the ore in the lowest levels to be quite as good as in the upper workings, and it is evident that variations along the dip are not greater than those observed from place to place along the strike. It is true that the mine records for a period of years show a gradual decrease in the value per ton of the material which has been treated. This is especially noticeable in the case of the Treadwell mine, which has been the longest in operation, but it is the result of increasing the tonnage by mining low-grade rock, rather than an indication that the average value is decreasing with depth.

It seems fair to assume that the ore will continue to at least a considerably greater depth without important change in average value. There is nothing in the character of the ore to indicate any important secondary concentration of values by oxidizing waters near the surface. On the other hand, the characteristics of the deposits are believed to indicate that it was formed in its present condition by the direct action of ascending waters, and that practically no subsequent or secondary concentration has taken place. If this idea is correct, there can be little doubt that mineralization and the ore will continue to a much greater depth than has been reached, and it may be fairly anticipated that the limit of deep mining will finally depend more upon increased costs attendant upon hoisting and pumping than upon exhaustion of the ore.

MEERSCHAUM, which has heretofore come from Turkey, in Asia Minor, has recently been found in New Mexico, and the scarcity which has characterized its production during the past few years will, from present indications, soon be at an end. The mines are in the Diablo range of mountains, about 20 miles northwest of Pinos Altos, to which a branch of the Santa Fe railroad runs from Deming. Two veins have been stripped for 1,500 ft. each; in them there is carried, between strongly defined walls, meerschaum in widths of 20 in. The veins are vertical and give evidence that they were formed through the splitting apart of volcanic conglomerate, a theory still further confirmed by the blowouts and deposits of float that have been thus far discovered, and finally by the fact that kidneys of pure meerschaum in various sizes are obtainable from this surface material, although it has been subjected to the decomposing effects of the elements, impregnation of vegetable matter, and the seepage of other minerals in solution into it for centuries. A wagon-road is now being built from the mines to Pinos Altos, a distance of 20 miles, and when this is completed the meerschaum will be marketed.

SWISS DENATURED ALCOHOL.—The Federal Government of Switzerland has a monopoly of the alcohol-supply industry of that country. Denatured or industrial alcohol is sold by the Government at cost—about 25c. per gallon. It is prohibited to mix any substance with denatured alcohol that would counteract the effect of the denaturation or change its taste or smell. There are two methods of denaturizing the alcohol—the complete and the incomplete. The complete method is applied to spirits which are to be used for heat, light, and power purposes. This alcohol is fully denatured; pyridine is used as a base and the process is secret and frequently changed. Incomplete denaturation prevents the alcohol from being used as a beverage, but does not destroy its properties for special uses.

Decisions Relating to Mining.

Specially Reported for the MINING AND SCIENTIFIC PRESS.

The pit-boss of a mine may delegate to a miner the duty of making an inspection. And where such duty was delegated to a miner, while performing such duty, he was as to his co-workers a vice-principal and not a fellow servant, irrespective of his ordinary duty. And a miner may recover for injuries which resulted from the negligent performance of duties of the person to whom the power of the pit-boss was so delegated.

Western Coal Co. v. Buchanan, (Ark.) 102 S. W. 694. (Apr., '07.)

A mining lease provided that the lessee should have one year to explore for ore, and immediately thereafter he should commence mining operations, and if he failed to prosecute the operations, and during the remainder of the term failed to mine, for a continued period of one year, and raise the ore on which royalty was payable, the lease should be void at the option of the lessor, except as to the liability of the lessee therein. It is further provided that after one year from the date of the lease that the lessee must mine at least one thousand tons of coal annually, or pay the royalty on that amount. An action to forfeit the lease could be maintained after one year on the lessee's failing at any time to prosecute the mining operations for a year; and the acceptance by the lessor of the minimum royalty was not a waiver of the right to forfeit the lease for the failure to mine for such year.

Chauvenet v. Person (Pa.) 66 Atl. 855. (Apr., '07.)

The provisions of the Tennessee statute permitting a mine to be operated for thirty days without a licensed foreman, without being subject to penalty, was held not to give an unlicensed foreman the standing of a lawful foreman under such statute, during the first thirty days of his employment, even though he was subsequently licensed; but that until so licensed the owner or operator was in control of the operation of the mine as before the enactment of the statute, and his liability was not affected thereby.

Cumberland Coal Co. v. Gray, 152 Fed. 939. (March, '07.)

A person advanced money to purchase certain mines under an agreement that he should receive a proportionate share of the capital stock of a corporation to be formed for the purpose of operating such mines. On a failure to issue and deliver the proportionate amount of the capital stock after the corporation was organized, it was held that the person so advancing the money might have specific performance of the agreement, where it appeared that the stock had no known value and that the damages were incapable of ascertainment.

Rau v. Seidenberg, 104 N. Y. S. 798. (March, '07.)

Where unforeseen difficulties in the operation of a mine prevented the lessee from operating it at a profit or in competition with other mines in the particular vicinity, the lessee was held not liable for the payment of a specified royalty for coal not actually mined, where the lease provided that payment should be made, unless the lessee was unavoidably prevented from taking out the coal.

Wilson v. Big Joe Block Coal Co., (Iowa) 112 N. W. 89. (June, '07.)

A lease to mine coal and other minerals and pay royalty thereon to the lessor, provided that the mining was to be done at the lessee's discretion, and that no cessation of operations or failure of the lessee to avail himself of the privileges conferred by the lease should operate as a forfeiture thereof. This was held to be a mere option, based upon no consideration, and could be withdrawn at any time before money was expended in doing what was optional upon the part of the lessee.

Collins v. Smith (Ala.), 43 So. 838. (April, '07.)

Ore Deposits in Serpentine.

Written for the MINING AND SCIENTIFIC PRESS
By WILLIAM FORSTNER.

The term serpentine is rather vague; serpentine is really the name of a secondary mineral, occurring substantially in all the varieties of rocks in which chlorite is found.¹ Under the name of serpentine are included rocks which, whatever might have been their original character and composition, now consist mainly or wholly of serpentine. They display a variety of texture according to the character of their components, and the remains of the original minerals are often present. They are the product of regional metamorphism.² It is evident that all stages of serpentinization are found, and the line of demarkation between more or less altered basic igneous rocks and serpentines cannot be drawn rigidly.

Serpentine, in a majority of cases, is an alteration product of basic igneous rocks, although occasionally of sedimentaries. This alteration, including an increase of volume, must take place in the upper zone of the earth's crust. The igneous rocks altered into serpentine are prominently the basic gabbros and peridotites.³ The gabbros are relatively high in alumina, and the peridotites high in magnesia.

It is evident that during the alteration of these rocks, an excess of alumina and magnesia may be present, which would cause the aggregation of corundum, (Al_2O_3), and magnesia, which, in the presence of the carbonic acid existing in the waters within the belt of weathering, will form magnesite ($MgCO_3$).⁴

Both these minerals are found in considerable masses in the serpentines, and as far as I know, occur only in those rocks. Corundum is an original constituent of igneous rocks, and its formation in serpentine may be a result of fractional crystallization in the original igneous rocks.⁵

The principal metallic ore deposits in serpentine (using the term of ore deposit in the sense of "deposits or orebodies, having sufficient development and carrying sufficient values to be commercially workable, or carrying indications that by further development, such commercially workable orebodies can probably be opened up") contain chromite and quicksilver ores, and, exceptionally, copper ores. Generally the metallic minerals are found disseminated through the serpentine their concentration occurs only occasionally, and then only associated, in the majority of cases, with a fracturing and re-cementing of the rocks.

As far as the available literature bears on the subject, the question why the concentration, by solution and re-precipitation, occurs so rarely in serpentine, does not seem to have been investigated.

J. H. Pratt has made a special study of the occurrence of chromite in peridotites.⁶ In this article Mr. Pratt calls attention to the constant association of corundum and chromite with peridotites, and offers the following explanation for the occurrence of chromite: Chromite should be regarded as having been held in solution by the molten mass of the peridotite and formed at the same time as the peridotite, crystallizing out among the first minerals during the process of cooling.

Morozewicz and Lagorio⁷ have proved that we must regard a fused mass of rock as a liquid, having similar

properties to an ordinary solution. Their experiments have shown that a molten basic glass, similar in composition to the basic magnesian rocks, dissolves alumina readily, and that upon cooling, the first minerals to separate out are corundum and spinel.

When a fused mass of rock begins to cool, the minerals will separate out, not according to their fusibility, but according to their solubility in the fused mass. The more basic minerals being the less soluble, will separate out first, and this crystallizing out from the solidifying mass would take place first on its outer boundaries. This is not the same as the differentiation of rock magmas, but is essentially the idea advanced by Becker.⁸ I do not well see the difference between fractional crystallization as herein explained and magmatic segregation, as for instance, expounded by Svante Arrhenius ('Genesis of Ore Deposits,' p. 644), and Kemp ('Handbook of Rocks,' p. 20). They are both to be distinguished from the sudden cooling of lavas, occasioning glassy groundmasses.

The peridotite belt that runs through North Carolina consists to a great extent of dunite, while northward the alteration into talc and serpentine is much more prominent. In the southern portion the peridotite occurs generally fresh at the surface, with very little serpentine. Microscopical examination shows the serpentine between the particles of dunite.

The literature concerning the origin of chromite is scant.

Hitchcock mentions⁹ chromite as occurring in minute grains through most of the serpentine, and occasionally in pockets. G. H. Cook mentions¹⁰ the presence of numerous small particles of chromite in the serpentine at Hoboken. C. D. Smith says¹¹ "chromite occurs in the chrysolite rocks throughout the entire range." J. W. Lewis states¹² that small octahedrons or rounded grains of chromite or picotite are sparingly scattered through nearly all the peridotite rocks. The same facts are mentioned in the geological reports of Georgia, Pennsylvania, and Maryland. F. D. Adams¹³ remarks: "The constant association of chromite with serpentine, which rock is a decomposition product of basic eruptive rocks, rich in olivine, points very strongly to the probability of this mineral also being a product of the differentiation of basic igneous magmas during cooling, and before their solidification and alteration to serpentine."

Glenn¹⁴ says: "It is an impressive fact that chromic iron is found in serpentine only, or in some rock akin to it, and like it metamorphic."

Mr. Pratt describes the occurrence of the chromite in North Carolina as follows: The chromite occurs in the peridotites mostly in grains and crystals, and imbedded masses situated near the boundaries of the lenticular bodies of peridotites, not in well defined veins, but in masses and pockets, which have "apparently" no relation with each other.

Where larger deposits of chromite occur there has been little or no corundum found, and the reverse, where corundum is abundant little or no chromite is found.

The chromite shows little or no crystalline structure.

The theory of fractional crystallization accounts for all phenomena of these chromite deposits.

In the North Carolina occurrence three features are apparent, namely, the intrusion of peridotite in gneiss, the formation of the chromite zone, and the apparent isolation of the chromite deposits by erosion.

¹ Van Hise 'Treatise on Metamorphism,' U. S. G. S. Monograph 47, p. 349.

² Kemp 'Handbook of Rocks,' p. 142; Gekle 'Textbook of Geology,' pp. 241 and 791.

³ Kemp 'Handbook of Rocks,' p. 111, and Gekle 'Textbook of Geology,' pp. 240 and 241.

⁴ Van Hise—Above cited, p. 243.

⁵ J. H. Pratt, *American Journal of Science*, 4th series, Vol. VI, July 1898, p. 49.

⁶ *Trans. A. I. M. E.*, Vol. XXIX, p. 17.

⁷ *Zeitschrift für Kristallographie*, Vol. XXIV, pp. 281 and 285.

⁸ 'On the Fractional Crystallization of Rocks,' *American Journal of Science*, 4th series, Vol. IV, 1897, p. 261.

⁹ 'Geology of Massachusetts,' Pt. I, p. 191 (1841).

¹⁰ 'Geology of New Jersey,' 1868, p. 326.

¹¹ 'Geology of North Carolina,' Vol. I, 1875, Appendix, p. 166.

¹² North Carolina Geological Survey *Bulletin* 11, 1896, p. 18.

¹³ 'On the Igneous Origin of Certain Ore Deposits,' General Mining Association, Province of Quebec, Montreal, January 12, 1894.

¹⁴ 17th Annual Report U. S. G. S., Pt. III, p. 164.

In his discussion, Mr. Pratt does not touch the question of re-distribution of mineral components, which accompanies the alterations, inevitably taking place in the upper zones of the earth's crust. Accepting his statement that the peridotites in North Carolina are fresh, the presence of serpentine in dunite, mentioned by him, indicates that this alteration process is going on. The occurrence of chromite in the serpentines, mentioned by him, must also be taken into account.

The absence of concentration of the chromite may be due to the fact that chromite is a very stable oxide, so that no alteration product of chromite is known, which would indicate that the solutions percolating through the belts of weathering and of cementation are not able to cause the concentration of the chromium minerals, by solution and re-precipitation, as is the case with the minerals of other metals.

The quicksilver ore deposits, especially those of the Coast Range of California, are associated with serpentine. The latter are nearly exclusively deposited in pre-existing openings, and are closely related to Tertiary or post-Tertiary eruptions.¹⁵ This ore deposition was also closely associated with a silicification process, during which the silicious solutions permeated fractured rocks, principally serpentine, dissolving the bases and depositing opal. The quicksilver ore deposits are formed by precipitation from solutions.¹⁶ As this precipitation process took place in the upper zone of the earth's crust, principally in the belt of oxidation, the sulphides of other minerals were probably leached out. Prof. de Launay states regarding this point, that many of the former quicksilver deposits, which occur chiefly in recent rocks near volcanic eruptions, have disappeared from older ranges, partly destroyed by erosion.

The presence of cemented and indurated sandstones, chalcedonite, phthanite, and serpentine may represent various phases of the process of cementation in the belt of fracture. The cinnabar forms in the cracks, seams, and fissures of the silicified material, and its source is apparently extraneous to the serpentine, or its original rock.

As far as I have been able to ascertain, the only rich copper ore deposits in serpentine, as yet found, are situated in northern Italy.¹⁷

The mineral serpentine is an alteration product of various minerals, and consequently the rock 'serpentine' is the alteration of various rocks, both igneous and sedimentary. The igneous rocks, from which serpentine is an alteration product, often carry metallic minerals, but apparently the alteration process into serpentine does not favor a sufficient aggregation of these metallic minerals to form orebodies; and apparently the serpentine rock is not a favorable material for the trunk channels of circulation, in which solutions deriving their metallic mineral components from other sources, would find favorable conditions for deposition. Consequently, most generally the metallic minerals are found disseminated through the serpentine, or aggregated into small masses.

In 'The Copper Deposits of the Encampment District, Wyoming,' by A. C. Spencer,¹⁸ it is stated: "No important ore occurrences have been noted in this rock (serpentine), but sulphides are found enclosed in it, in some places." This is the only occurrence of copper ore in this country of which I find mention.

According to the Grass Valley special map of the Survey, there is a system of more or less parallel veins of

gold ore in serpentine in that district. Unfortunately my notes and library were burned in the San Francisco fire; both reference libraries in this city have been destroyed, and by reason of repairs being carried on in the Ferry Building, the library of the State Mining Bureau is largely inaccessible. In the folio, the relation of the serpentine to the enclosed quartz veins are not discussed, but I am sure that in Lindgren's report on this district¹⁹ this point will be discussed. In the above cited folio, Mr. Lindgren, speaking in a general way on the gold-quartz veins, states that these were formed in fractures, which are posterior to the general metamorphism of the country. The only further reference on this subject, at my disposal at the present moment, is in 'Genesis of Ore Deposits,' where Mr. Lindgren mentions the fact that in the Grass Valley district, the serpentine adjoining the Idaho vein is transformed into magnesite, mixed with quartz and some residual serpentine. This occurrence is similar in nature to that wherein I consider the quicksilver ore deposits of the Coast Range have been formed.

In my report on the copper occurrence on the Nicolini ranch in Napa county, California, I suggested as the possible genesis of the native copper aggregates found in the serpentine, that the copper sulphate in the percolating solutions had been precipitated by ferrous salts derived from the ferro-magnesian silicates, during their alteration into serpentines, chlorites, etc. Clarke and Diller²⁰ attribute the concentration of nickel to a similar process. They consider that the nickel was originally a constituent of the olivine, and separated out during the process of the alteration into serpentine. This nickel was taken into solution by the percolating waters in the zone of rock decay, and precipitated as a coating on the walls of cracks and in small veins.

CARNOTITE IN COLORADO.—The name carnotite was applied in 1899 to a canary-yellow ochreous pigment that was found impregnating a silicious sandstone in Montana county, Colo. This mineral is a source of the rare elements uranium and vanadium, and tests have also shown that it contains the still rarer element radium. Uranium and vanadium have attracted much attention in recent years, uranium being used as a pigment in photography, and vanadium being added to steel to increase its tensile strength, elasticity, and ductility. Uranium also has the property of increasing the hardness and elasticity of steel and of aluminum, but has not yet been much used for this purpose. Carnotite has been discovered at a number of places in Colorado and adjacent parts of Utah. Particularly interesting deposits are found near the valley of Coal Creek, about 14 miles northeast of Meeker, in Rio Blanco county, in the northwestern part of Colorado.

AUSTRIA-HUNGARY MINING.—The value of minerals produced in Servia in 1905 was \$465,052, of which \$309,984 was coal, \$50,299 gold, and \$31,614 lignite. By a special law the Government is the owner of the under-soil and makes all the regulations for prospecting and mining. The right to prospect is for one year and can be renewed. Mining concessions are granted for 50 years to those who prove that the territory can be exploited, that they have sufficient capital to make a success of the project, and that they or their employees have the necessary mining knowledge. After 15 years of uninterrupted work the person receiving the concession becomes the proprietor. A yearly fee of \$2.31 for each 100,000 sq. m. (119,000 sq. yd.) of a concession is charged and one per cent of the total receipts.

¹⁹ 17th Annual Report U. S. G. S., Pt. 2.
²⁰ *American Journal of Science*; Series 3rd, Vol. XXXV, p. 1483. See also J. E. Spurr, 'Geology Applied to Mining,' p. 12.

¹⁵ 'The Quicksilver Resources of California,' Bulletin No. 27, California State Mining Bureau, p. 21.

¹⁶ Above cited, p. 3; G. F. Becker Monograph 13, U. S. G. S., p. 419; S. B. Christy, *American Journal of Science*, Vol. XVII, 3rd series, p. 453.

¹⁷ Van Hise, above cited, p. L047.

¹⁸ Professional Paper No. 25, U. S. G. S., p. 35.

Mineral Land—An Important Decision.

We publish herewith the text of a letter from the Secretary of the Interior to the Commissioner of the General Land Office. It reviews litigation over certain mineral tracts in Placer county, California, and it reverses finally a decision of the Commissioner in regard to the conflicting applications for timber-land.

Five years ago some timber lands were located on the ridges of the Forest Hill divide, in Placer county. This is a region famous for its 'deep leads,' that is, ancient alluvial channels now covered with lava. In these gravel deposits successful mining has been conducted in a systematic manner for thirty years or more, and claims were located along the supposed course of the old river-beds. Of course, the exact position of them could not be ascertained beforehand, and therefore most of the ground located bore no evidence of its mineral value. In the same way, the existence of oil is not often indicated by the surface and until bores intercept the productive stratum, a potential oilfield looks like anything but the place for a mineral industry. In the case of oil, it has been decided that pending the exploration and testing of land supposed to be valuable for this mineral substance, the ground can be held under mineral location. The decision of the Secretary of the Interior in the two cases referred to in the subjoined letter is in accord with the spirit of the law and will be highly gratifying to those engaged in this class of mining.

The protestants in the above case were Frank A. Leach, president of the Eureka Con. Drift Mining Co., and Charles F. Hoffman, representing the French company operating at Red Point. Mr. Leach is the present superintendent of the San Francisco Mint; he has been selected to succeed Mr. George E. Roberts as Director of the United States Mint. Mr. Hoffman is an engineer of reputation and one of a family long identified with progressive mining methods in California. The letter follows:

DEPARTMENT OF THE INTERIOR,
WASHINGTON, May 2, 1907.

Alfred Dixon, et al. }
r.
Byron I. Taylor, et al. }

The Commissioner of the General Land Office:

SIR:

November 24, 1902, pursuant to the Act of June 3, 1878 (20 Stats., 89), timber-land applications for tracts in T 15 N, R 12 E, M. D. M., Sacramento (California) land district, were filed as follows:

No. 1,791, by Byron I. Taylor for NW $\frac{1}{4}$, Sec. 8.

No. 1,792, by Ibo I. Heyen for S $\frac{1}{4}$, SW $\frac{1}{4}$, NW $\frac{1}{4}$, SW $\frac{1}{4}$, NW $\frac{1}{4}$, Sec. 20.

No. 1,793, by Charles A. Shannon for E $\frac{1}{4}$, SE $\frac{1}{4}$, S $\frac{1}{4}$, NE $\frac{1}{4}$, Sec. 20.

No. 1,794, by William Esterbrook for W $\frac{1}{4}$, SE $\frac{1}{4}$, NE $\frac{1}{4}$, SW $\frac{1}{4}$, SE $\frac{1}{4}$, NW $\frac{1}{4}$, Sec. 20.

No. 1,795, by Charles C. Root for NE $\frac{1}{4}$, Sec. 8.

Notice of the submission of proof before the local officers on March 5, 1903, was given, each timber land claimant designating the four other applicants as his witnesses. On the day fixed proof was taken in support of each application and each applicant, and his two witnesses were cross-examined by a special agent. The proofs submitted appear to be in the usual form and indicate *prima facie* that the tracts sought are of the character and condition contemplated by the timber-land act. The purchase money for the land was tendered, and in each case refused because of the pending protests mentioned below.

On March 5, 1903, and prior to the submission to the

timber proof, Alfred Dixon and seven others filed their verified protests, one against each timber-land applicant but all substantially similar in form and contents, and Frank A. Leach, president of the Eureka Consolidated Drift Mining Co., joined with Charles F. Hoffman, agent of the Soci  t   Anonyme des Miners de Golden River, in filing two protests essentially similar, one directed against timber-land application No. 1,791 and the other against application No. 1,795. The recitals contained in the protests are lengthy, but the protestants in substance and effect allege that the tracts applied for contain gravel deposits carrying gold and quartz veins or lodes bearing gold and silver in paying quantities, and are more valuable for mineral than for timber or agricultural purposes; that portions thereof are embraced in mining claims; that the tracts are situated in a mineral belt and in the midst of one of the richest mining districts in the State, and that the timber applicants are not applying for the land in good faith for their sole use and benefit, but for and in the interest of an association, or corporation, with the design of fraudulently acquiring mineral land. The protestants asked for a hearing.

July 13, 1903, the hearing commenced, all parties being represented by counsel. Ten witnesses were produced by the protestants and examined. The protestees presented no witnesses but rested their case upon their timber proof which was specially offered in evidence and objected to by the protestants on the ground that no opportunity had been offered for cross-examination upon the non-mineral return of the land in question, and upon the cross-examination of protestants witnesses.

October 12, 1904, the receiver of the local land-office recommended that the plats applied for situated in the N $\frac{1}{4}$, Sec. 8, and in S $\frac{1}{4}$, N $\frac{1}{4}$, Sec. 20, be adjudicated mineral in character, and that the application as to said tracts be rejected, while the Register recommended that all the land applied for be adjudged mineral and all the applications be rejected.

Both parties prosecuted appeals to your Office, which on October, 1905, decided that the lands applied for were non-mineral in character and were properly subject to disposition under the Timber Act; and it was stated that in the event such decision became final, and in the absence of other objections, the timber proofs offered would be accepted, and upon proper payments final receipts and certificates would be issued. The protestants have appealed and contend in substance that the decision of your Office is unsupported by and contrary to, the evidence.

The record, which has been fully examined, is too voluminous and the evidence enters into details too numerous, to warrant the undertaking of an extended discussion. Miners of the vicinity, mining engineers, and experts testified, and among them was Ross E. Browne, an eminent geologist and an authority on deep-channel placer deposits of the character here involved.

By the evidence adduced, it is shown that the lands in Sec. 8 are upon the western slope of the Sierra Nevada mountains, upon the Forrest Hill divide, an extensive ridge consisting of a thick volcanic cap overlying valuable auriferous placer deposits in gravel beds and channels of an ancient river valley, the boundary rim of which has been carefully determined. There are many paying mines within the ridge in the near vicinity. Above the land here involved four deep gold-bearing channels and a large area of an underground auriferous gravel bed have been worked by means of tunnel and drifts; while below, three well-defined ancient channels have been capped and developed, besides a number of gravel beds of small area. It is clearly indicated that these gravel beds, owing to their extensive distribution, are but portions of a general deposit existing throughout that region of the

divide, and that some, if not all, of the gravel channels mentioned, owing to their grade and general trend toward the land in question, must, in their onward courses, pass through, and exist beneath, the north half of Sec. 8. From that portion of one of these channels in the southern part of Sec. 8, not less than \$100,000 in gold has been extracted. This channel has been worked for many years and has always paid. The main drift thereon is almost four miles in length and is directed toward the eastern portion of the N $\frac{1}{2}$ of Sec. 8.

The Colfax folio of the Geological Survey, which was received in evidence over the general objection of the protestees that it was incompetent and irrelevant, but which the Department believes may properly be considered, deals with the area in which the land in controversy is located and is corroborative of many points of the testimony. In the folio, geologist Lindgren states:

"The fluvial origin of the gravel channels and the general disposition of these ancient rivers are not theories; they are facts convincingly and completely proved. The remarkable absence of faults over the western slope has been a great aid in the interpretation of the gravel channels."

In view of all the features of this case disclosed by the evidence, taking into consideration the geological formation, the disclosures of valuable deposits in the adjoining and surrounding lands, and the general trend and pitch of the known channels toward these tracts, together with the essentially similar and identifying characteristics of the entire divide, the Department is clearly of opinion that the N $\frac{1}{2}$ of Sec. 8 is actually mineral in character and valuable for its deposits of placer gold and therefore not subject to disposition under the provisions of the Timber-land Act. As to this land the decision of your Office is reversed.

The tracts in Sec. 20 embraced in the timber-land applications about two miles directly south of the land involved in Sec. 8, are shown to be situated upon a southerly projecting spur of the divide, and are not covered by the lava cap. After a careful consideration of the evidence, the Department is of the opinion that as to these facts no such showing of the existence of a valuable mineral deposit has been made as will defeat the timber-land application. As to the land in Sec. 20 the decision of your Office is accordingly affirmed.

The papers are herewith returned for further proceedings in accordance with the views herein expressed.

Very respectfully,

(Signed) J. R. GARFIELD,
Secretary.

PROTECTIVE PAINT.—The majority of authorities acknowledge that a linseed oil paint affords the better protection for structural steel, metal, and wooden surfaces. The oil paint is also more economical by reason of its ease of application and better covering power. The life of the oil is the life of the paint and on the life of the paint depends the protecting quality. To further these ends the best boiled linseed oil must be used and inert pigments, that is, pigments that have no chemical action on the oil. The prevailing conditions of nature only too soon perform this destroying feature. The two pigments that today are being used successfully in protective paints are silica and flake graphite. The silica is inert, unaffected by heat and gases and gives the paint a good heavy body. The graphite is light, flake-like in formation, forming a compact shield-like surface, possesses great lubricating qualities which afford an easy application of the paint, is unaffected by heat and gases and when properly mixed with the silica and linseed oil, adheres to the surface and forms a protective coating.

Big Nuggets.

The *Australian Mining Standard* gives a list of the nuggets recently found at Poseidon, a new goldfield in the Tarnagulla district of Victoria. This has caused much excitement in Australia.

Altogether no fewer than 77 nuggets have been unearthed at a few feet from the surface. The principal lumps were: 953 oz. gross, 703 oz. net. There are 15 over 80 oz. gross. They weigh 953 oz., 675, 502, 387, 373, 252, 206, 152, 148, 146, 127, 104, 87, 86. Recent yields from puddling operations are 21 loads for 38 oz., 12 loads for 14 oz., 18 loads for 19 oz., 16 loads for 14 oz., 12 loads for 8 $\frac{1}{2}$ oz., 18 loads for 12 $\frac{1}{2}$ ounces.

Reporting on the field, A. M. Howitt, of the geological branch of the Victorian Mines Department, says that the shallow sinking is in dark brown surface soil and clay, and it was in this ground that the largest nuggets were found. The Poseidon, weighing 953 oz. gross, discovered by Woodall and party on December 12, 1906, was perched two inches above a conical bump, and within 10 inches of the surface. The Christmas Box, 373 oz.; the Hazel, 502 oz.; Georgina, 98 $\frac{1}{2}$ oz.; the Leila, 675 oz.; Federal, 387 oz.; and a small specimen of 21 oz., were all discovered in this surface clay, and a few inches off the bottom.

The gross weight of these few nuggets, together with a little gold obtained in addition, would total just over 3,000 oz., taken from a length of 84 ft. measurement between the two extreme nuggets. Of these, Smith, Stephenson, and Rogers obtained 1,672 oz., which yielded 1,382 oz. on smelting. This claim has given £1,900 per man, and has been, so far, the richest claim on the rush.

The next rich claim, and the one where the first shafts are seen, is that of Jackson & Hughes. Here the ground is 8 to 10 ft. deep, and the sinking of red sand, clay, and gravel occurs in a gutter with a somewhat bumpy bottom. This claim has yielded several large nuggets, among them being the Little Jack, 252 oz., and the Little Ben, 152 oz. The larger nuggets were all up from the bottom.

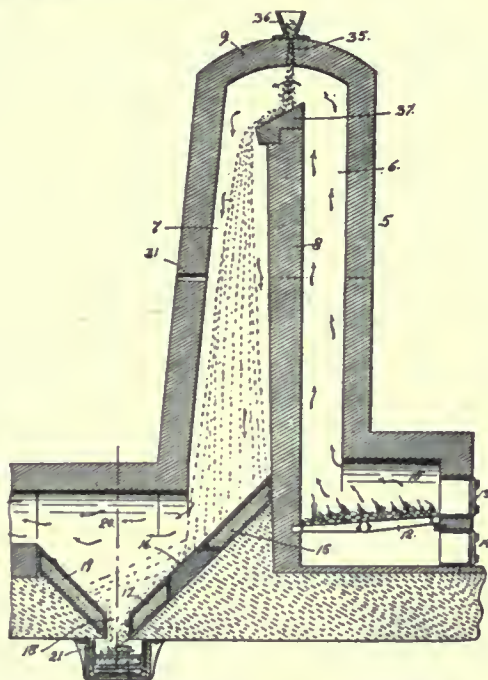
The next of importance is Wragge Bros.' claim. Here the sinking is in red sand and rubble of slate and sandstone was about one foot of white and red puggy seams, then one foot of sand and clay with floating pieces of slate and sandstone, and on the bottom white clay and angular quartz. The gutter containing the best gold is only about 15 ft. wide, and shows more quartz. Among the large nuggets from this claim may be mentioned the Port Arthur, 206 $\frac{1}{2}$ oz. Nearly all the nuggets were on the bedrock. Cox & Newitt's claim has had consistent yields, and the sinking is similar to Wragge Bros.' claim. The largest nugget is the Shellback, 127 $\frac{1}{2}$ oz. gross, containing much quartz.

On the whole, the gutter is narrow, but very rich in the shallowed claims. It has a bumpy bottom of Ordovician slate and sandstone, and many small turns along its course. The nuggets have been generally found up from the reef-rock and mostly on the north side of the gutter. In the shallow ground to the south of the main gutter several nuggets have been found in the dark-brown surface clay. These outside nuggets are scattered here and there, and so far not in relation to one another, as they would be if in another gutter. The nuggets, Mr. Howitt says, should not have traveled far from the original quartz veins, which should occur in the Woolshed Hill belt. This belt shows nice pitted green and other slates and sandstone of Ordovician age, fissured with large quartz bodies, showing lime, soda, feldspar, and indicating the close proximity of an igneous dike, which may be traced later on near the Woolshed reef.

MINING AND METALLURGICAL PATENTS.

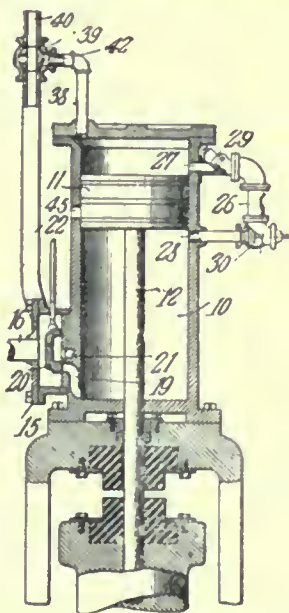
Specially reported for the MINING AND SCIENTIFIC PRESS.

ORE-ROASTING PROCESS.—No. 859,420; Arthur R. Wilfley, Denver, Colorado.



A process of roasting ore preparatory to magnetic separation, consisting in subjecting the ore particles while falling, to sufficient heat for roasting purposes, cooling the ore particles while in a disseminated state, sufficiently to overcome the clinging tendency, by bringing the said particles in contact with a non-liquid cooling medium, and causing said particles to be removed from said medium as fast as they fall, whereby the medium is maintained in a condition to effectively act on the successively falling particles.

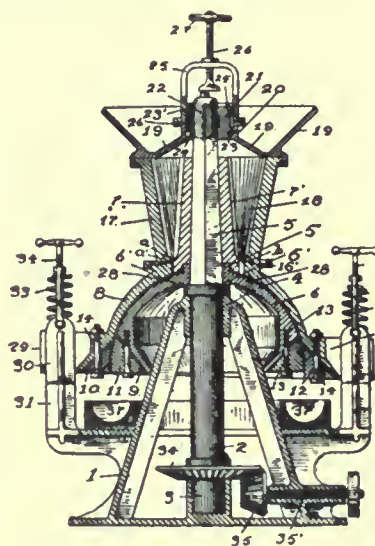
STAMP-MILL.—No. 859,629; Joseph F. Symons and William H. Paull, Lake Linden, Michigan.



In apparatus of the class described, a cylinder having upper and lower heads, means for controlling the admission and exhaust of an operating fluid to the lower portion of the cylinder, a by-pass having a controlling valve, and a check valve, said by-pass being arranged to admit a portion of the fluid from the lower to the upper portion of the cylinder, an exhaust pipe leading from the exhaust port, a valve casing in said exhaust pipe, a pipe placing the valve casing in communication with the upper part of the cylinder, and a three-way cock in the valve casing for con-

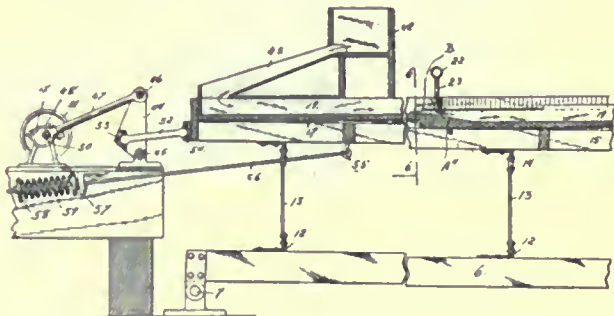
trolling communication with the upper part of the cylinder and the exhaust.

ORE CRUSHER AND PULVERIZER.—No. 859,835; Adolph J. Petter, Los Angeles, California.



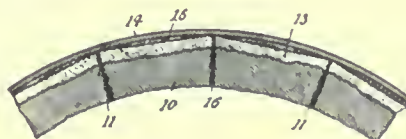
A crushing and pulverizing apparatus, the same comprising a suitable base, a central rotatable shaft, a spheroidal shell secured thereon, a crushing jaw secured to the shaft above the said shell, an idle eccentric on the upper end of the said rotatable shaft, an outer spheroidal shell inclosing the inner spheroidal shell, a circular die ring secured to the lower edge of each spheroidal shell, a crushing jaw secured to the upper edge of the outer shell, an ore hopper carried by said crushing jaw, a spider forming a connection between the outer crushing jaw and the central shaft, the idle eccentric working within the hub of said spider, and means for adjusting the outer crushing jaw and its connected parts vertically relative to the central rotatable shaft.

CONCENTRATOR.—No. 853,459; John F. Isbell, Denver, Colorado.



A rifled concentrating table having a vibratory movement in the direction of its length, the riffling also extending longitudinally of the table, the vibratory action of the table being adapted to cause the material to travel from the head toward the tail of the table, the latter consisting of sections arranged at different elevations and in stepped order, the head section of the table being highest and so on toward the tail of the table, each table section being provided with a cut off adapted to remove a suitable depth from the top of the material under treatment.

LINING FOR PEBBLE-MILLS.—No. 858,129; Max F. Abbe, New York, New York.



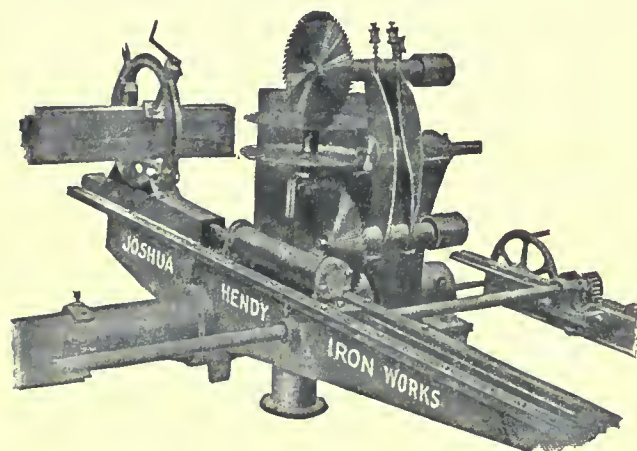
A cylindrical pebble mill provided with a number of natural lining stones each embedded at its sides, ends, and back in a coat of hardened cement, and means for securing adjoining coated stones to each other and also to the mill.

An Improved Timber-Framing Machine.

The accompanying illustration shows a timber-framing machine of a type furnished to some of the largest mining companies of the West. The following description will make clear the construction and operation of this labor-saving machine, the purpose of which is to reduce the cost of framing either round or square timbers for mine use.

A heavy finished iron column forms the bed on which the various parts slide when it is desirable to change the length of the timbers. This column is held by cast-iron boxes and is prevented from turning by steel pins. The parts shown on the right are set and remain stationary except in changing the sizes of the tenon. Those on the left are connected by threaded rods and can be moved together by a screw inside the column, so as to shorten or lengthen the timber; they can be adjusted to suit the tenon desired and to line up the saws. The vertical saw-arbors are driven by quarter-turn belts from the counter-shaft and have a number of collars by which the saws can be set as desired. The horizontal arbors are mounted on a swinging frame, by adjusting which these saws are made to line up with those in front. The frame has also a side movement on its spindle, which is clamped by the cap-bolts. This change can be effected without altering the belt, as will be seen by tracing its course from the top of the driving-pulley to the upper-saw pulley, around the small pulley on the adjustable counter-shaft just behind the machine, to the lower-saw pulley and return to the driver.

The various parts mounted on the column are prevented from turning by gibs, keys, and set-screws, in addition to which the main frames are provided with jack-screws to stiffen them. The illustration shows the method of holding square timbers, but, by a quick change in the chuck-jaws,



round timbers, also, from 8 to 18 in. diam., can be clamped. The chucks are made entirely of steel, and have teeth by which they are rotated 90° by an air-actuated rack and piston. The chuck and its cylinder are mounted on a slide, on the under side of which is a rack operated by a pinion on the long shaft that passes through the frames. This shaft can be rotated at will by means of the air-cylinder shown on the right.

With the saw in operation the timber is placed in the jaws, the chuck is closed and locked, the clamp-screws set down, and air is admitted to the large cylinder, causing the timber to pass through the saws. It is then returned, and air admitted to both small cylinders, causing the chucks to rotate 90°, when the second cut finishes the work. The valves controlling the admission and exhaust of air to and from the cylinders are placed in a position convenient to the operators. The question of lubrication of the rapidly revolving saw-arbors has been carefully worked out, each bearing having a sight-feed lubricator placed in plain view. All racks and pinions are steel and have cut teeth. Saw-guards are provided to cover the horizontal saws and end-gauge for setting the timbers.

The particular machine shown was made to work timbers from four to nine feet long between shoulders, 10 and 12 in. square; and round timbers from 8 to 18 in. diam., all of which sizes can be varied to suit the case.

These machines have been in operation, and very successfully too, at the Speculator mine of the North Butte Mining Co., and at the Original Con. Mining Co.'s saw-mill at Butte, Montana. The operation of the latter, we are informed, costs \$7.50 per shift for the labor of two men, plus the 30 h.p. required to operate it, and is framing completely 500 girts, or 450 caps, or 400 posts (all round or square timber) per shift of eight hours.

When the timber is delivered and taken away from the machine automatically, as at the Original Co.'s mill, likewise at the Speculator, the actual cost of framing with the machine is 2½c. per piece. When supplied with automatic handling devices such as live rolls etc., as is the usual practice, the timber is being framed, including the unloading of the timber from the cars, and the stacking of the finished timber in the stock piles, for six cents per piece.

Framing machines are now being built for the Red Metal Mining Co., and the Anaconda Copper Mining Co., and are nearly ready for delivery. These machines will work up to 24 in. round timber. An I-beam supports the back ends of the rails, and the drums are arranged so that the adjustable side of the machine can be set while in operation. These are also made heavier in all respects than heretofore. The principal features of this machine are fully covered by patents, Joshua Hendy Iron Works, of San Francisco, being the manufacturers.

Publications Received.

U. S. Geological Survey. Bulletin No. 315. Contributions to Economic Geology, 1906. Part 1, Metals and Non-metals, Except Fuels. By S. F. Emmons and E. C. Eckle.

U. S. Geological Survey. Bulletin No. 287. The Juneau Gold Belt, Alaska, by Arthur C. Spenser; and A Reconnaissance of Admiralty Island, Alaska, by Charles W. Wright.

U. S. Geological Survey. Bulletin No. 300. Economic Geology of the Amity Quadrangle, Eastern Washington County, Pennsylvania. By Frederick G. Clapp.

U. S. Geological Survey. Bulletin No. 296. Economic Geology of the Independence Quadrangle, Kansas. By Frank C. Schrader and Erasmus Haworth.

U. S. Geological Survey. Bulletin No. 308. A Geological Reconnaissance in Southwestern Nevada and Eastern California. By Sydney H. Ball.

U. S. Geological Survey. Bulletin No. 312. The Interaction Between Minerals and Water Solutions, with Special Reference to Geologic Phenomena. By Eugene C. Sullivan.

U. S. Geological Survey. Professional Paper No. 57. Geology of the Marysville Mining District, Montana. A study of igneous intrusion and contact metamorphism. By Joseph Barrell.

Commercial Paragraphs.

THE San Francisco office of the Sullivan Machinery Co. is at 26-28 Fremont St. Howard T. Walsh is the manager.

THE MINNEAPOLIS STEEL & MACHINERY CO. has opened an office at 352 Phoenix Bldg., Butte, Montana, under the management of J. E. Lanning.

THE Isthmian Canal Commission has decided that the walls of the canal, where it passes through rock, shall be channeled. This includes almost all of the 'wet prism' in the Culebra division, nine miles long, and also the walls of the locks at La Boca and Mira Flores. The advantages to be gained from channeling are several: the resulting wall is solid and unbroken by explosives, and is cut exactly to the surveyed line, no subsequent trimming or filling being needed, as in the case of a wall cut by drilling and blasting. For this work the Commission has ordered 24 Sullivan Class Y-8 channelers, fitted with air reheaters. This machine is similar to the Sullivan channelers used on the Chicago drainage canal and its extensions. This is the largest single order for channeling machines ever placed for either public or commercial purposes.

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TABLE OF CONTENTS

Editorial:	Page.
Notes.....	127
Gold Mining Reviewed.....	128
The Verdict at Boise.....	129
General Mining News.....	131
Special Correspondence.....	136
London.....	New York.....
Mexico City.....	Cripple Creek, Colorado.....
Toronto, Canada.....	Butte, Montana.....
	Denver, Colorado.....
Concentrates.....	142
Discussion:	
A Fundamental Problem.....	James W. Abbott 143
A Correction. Oaxaca.....	L. R. Hamer 143
An Abandoned Project.....	Jas. W. Neill 144
Secondary Ores of Copper.....	H. E. West 144
Articles:	
Geology of Jamaica as Related to its History.....	Rossiter W. Raymond 145
Present Status of the Gold Mining Industry.....	J. H. Curle 147
Production of Copper.....	L. C. Graton 151
Reduction of Quicksilver.....	151
Hints on the Design and Construction of Wooden Trestles.....	R. Balfour 152
Electrically Operated Hoist with Reels.....	156
Mining and Metallurgical Patents.....	155
The Prospector	150
Decisions Relating to Mining.....	154
Departments:	
Personal.....	130
Market Reports.....	130
Books Received.....	156
Catalogues Received.....	156

Editorial.

THE MEETING of the Lake Superior Mining Institute has been indefinitely postponed, on account of the strike on the Mesabi range.

COPPER STATISTICS show that Arizona is pushing ahead of Michigan, and threatens the leadership of Montana. The figures collected for the Geological Survey by Mr. L. C. Graton appear elsewhere in this issue.

ANYTHING that Dr. R. W. Raymond writes is interesting whether it deals with Job or the Apex, but when he is condensing a large mass of general information and bringing it to bear on a special point, he demonstrates the qualities that have made him an engineer and an editor, a journalist and a lawyer. The article on Jamaica will be appreciated by our readers. It reminds one of Geikie's delightful writings on the scenery of Scotland as determined by geological structure, but it has a trenchant vigor that the great geologist might well envy. It is a fascinating subject, for no observant man can fail to be impressed with the interplay of physiographical and economic conditions. The explication by Dr. Raymond gives geology a vividly human interest, and suggests similar considerations in regard to other countries—the United States, for instance. The bleak coast of New England, the barrier of the Alleghenies, the Western plains, the ramparts of the Rocky Mountains, the deserts of the Great Basin, the Sierra Nevada, and the fruitful valleys of California, all in turn determined the character of the successive waves of immigration that made the American nation. Beneath the inequalities of the surface and the climatic conditions were geological facts, fixed before the oncoming of the first pioneer of a new people.

FROM New York there come, as our letter from there recites, various rumors concerning the Guggenheims and their relations with J. P. Morgan, the Standard Oil Company, and other financiers. We hope sincerely that the whirligig of speculative finance will not land the Guggenheims in the lap of 26 Broadway, for much as we may regret some of the recent performances of the family identified with the Smelter Trust, we would be sorry to see the smelting industry dominated by H. H. Rogers and his coterie of predatory promoters. That would be a change much for the worse. Any further concentration of power in Wall Street will be to the injury of the mining industry, which is already irritated by the feeling that its metal markets are subject to manipulation. In regard to consolidations of capital in general, we can say that they are inevitable and regrettable. The energetic and rapacious promoters of big undertakings find it convenient to co-operate; there is a "community

of interest" followed by a "gentleman's agreement," whereby the great resources of nature become controlled by a few. It does not always work, for nature is more generous than man, but until the monopoly becomes acute public opinion is slow to act and high finance goes unhindered on its gilded way.

REFERRING TO the article by Mr. Ross E. Browne on 'Costs on the Rand,' in our last issue, it is interesting to note that the chairman of the Rand Mines, Ltd., admits that "the cost of production at present is too high to allow of the remunerative investment of money on the average yield of the gold-bearing area of the Witwatersrand." In 1906 thirty-nine companies paid £5,565,972 in dividends, the market value of the mines owned by these companies was £56,305,227 (on April 2, 1907), and the estimated life of the mines at the present rate of extraction was 12.66 years. In order to redeem the market valuation, it is necessary to set aside £3,728,368, accumulating at 3%, compound interest, and this without allowing for interest on the investment. On these figures the return to investors is less than 3¼%, indicating that the market though depressed is not yet on bedrock, for even the most assured form of gold mining should pay 5% after allowance for amortization of capital. It is the slow recognition of this fact that has saddened the Kaffir circus.

OUR esteemed contemporary at London, *The Mining Journal*, publishes an interesting resumé by Dr. Malcolm MacLaren of the information obtainable concerning the goldfields of Tibet. Even before the Welcome there were great nuggets, for it is recorded that Genghis Khan sent one to the Sultan Mohammed "as big as a camel's neck." This came from southwestern Tibet, a region never yet explored by any modern engineer or geologist, despite recent military expeditions upon the Roof of Asia. The best account available is that of a Hindoo explorer employed by the Trigonometrical Survey of India. This native, a prototype of Kipling's 'Kim,' penetrated the highlands of Tibet in 1867, reaching one of the goldfields, where an excavation one mile long was the scene of rudimentary alluvial mining. This was Thok-Jalung, at 16,330 feet above sea-level. It was so cold there that the natives pitched their tents in pits seven or eight feet deep, thus suggesting the story of the gold-digging ants mentioned by Herodotus. Other diggings, at 15,280-ft. elevation, were visited by this native explorer and in the Daurakpa region the mining people lived in caves, as a means of protection against roving brigands. The descriptions suggest deposits of cemented gravel. The goldfields reported last year by Sven Hedin are the northern extension of the districts just mentioned. It is apparent that the gold is widely spread over a lofty wind-swept region, the climate of which is severe. Compared to Tibet, Alaska is a health resort. As yet there is no confirmation of a richness sufficient to compensate for the remoteness, inaccessibility, and inclemency of this Asiatic goldfield.

Gold Mining Reviewed.

GOLD MINING in its world-wide aspect is discussed in this issue by Mr. J. H. Curle with an authority that will be unquestioned. There is no one with so intimate an acquaintance with the scattered goldfields of the world and no one who being possessed of the facts is likely to state them so frankly. In regard to the Rand, Mr. Curle is in the ungracious position of "I told you so" and it argues some forbearance on his part that he does not dwell on the warnings he made in *The Economist* several years ago, at a time when a rosy hue suffused the Kaffir market. In his criticism of the expenses due to the elaborate direction of affairs at the head offices and the apparent extravagance of directors' salaries as compared to the close shaving of costs at the mines, he touches a vital spot. The thrift of directors in regard to the staff at the mine and mill as compared to the fees paid to ornamental boards in London reminds us of the patriot who was willing to sacrifice all his mother-in-law's relatives for the good of the country. In regard to Chinese labor, Mr. Curle supports the mine operators, that is, his views are wholly divorced from politics or a half-informed philanthropy; he discusses the problem solely as belonging to the domain of economics. The labor question is facing us at every hand, it is difficult enough, and in the solution of it good sense is more valuable than sloppy sentiment.

In regard to American gold mining, we note that Mr. Curle believes in Nevada and prophesies a great future for that State. In this expression of opinion, as in the emphasis laid upon the evils of over-capitalization, we cordially agree. Gold mining in Nevada is likely to suffer as much from the inflation of stocks representing splendid mines as she has suffered from the sinking of money into worthless schemes. Between these two extremes of financial chicanery, the speculator is in constant danger and if the industry that has made such splendid mining districts as Goldfield and Tonopah is to enrich the community in a legitimate way, it will be done by avoiding practices that disgraced the Comstock.

A bird's eye view of gold mining today presents one particularly satisfactory feature; we refer to the finding of rich ore on the deep levels of two or three famous mines. Our London correspondent tells us that a 4-ft. vein of 17 dwt. ore has been cut in the Champion Reef mine, on the Mysore goldfield, by a vertical shaft at a depth of 2,405 feet, which is 160 feet below any existing workings. The Champion Reef is one of the great gold mines of the world, for it produces about \$3,500,000 per annum. At El Oro, in Mexico, the El Oro mine has become rejuvenated by the discovery of rich sulphide ore at 1,000 feet after an interval of acute impoverishment below 400 feet, this being the lower limit of profitable oxidized ore. A discovery such as this is of immense importance to mining at large; for it is not too much to say that any company lacking working capital could never have faced the expense incurred in the exploratory work that has been rewarded by this important development. Similarly, the showing at 1,900 feet in the Great

Boulder Proprietary at Kalgoorlie is most encouraging. Thus three great goldfields—the Kolar, El Oro, and Kalgoorlie—are illuminated by news of a character that makes glad the heart of the miner.

The Verdict at Boise.

THE ACQUITTAL of William D. Haywood by the jury at Boise City is an event of importance, for it is likely to have political consequences. Like others who have taken a keen interest in the labor troubles that have occurred in Colorado and Idaho during the last ten years, we followed the trial from day to day and read the evidence as reported in the press, together with the speeches of opposing counsel. Whatever our own deductions, we accept the verdict unreservedly, believing that the support of the jury system is more important than the conviction of any supposed criminal. It is apparent from the acquittal that the legal evidence was insufficient to prove the case against Haywood. On the whole the trial leaves a mixed impression. There was perjury on both sides, most of the witnesses were untrustworthy, the issue was befogged by appeals to prejudice, and finally the trial closed with a speech—that by Mr. Clarence Darrow—so obviously meant as an address to anarchists all over the country that it amounted to contempt of court. This scurrilous tirade, in its disgusting effrontery and its inflammatory references, was a disgrace to any bar of which the lawyer might be a member. Nevertheless the trial was conducted with a dignity and fairness creditable alike to judge and jury; it has proved the falsity of the clamor that the prisoners were being “railroaded to death.” Pettibone remains to be tried. Moyer is out on bail and Haywood is free. It is well; for there is not sufficient evidence to convict the two leaders, but if they suppose that the country at large considers them as martyrs to the cause of labor, they will be undeceived. As the red rag of anarchy is waved high in jubilation, those who owe fealty to the flag of their country will know what such rejoicing means, and many thousands who knew not the policy of the Western Federation of Miners have seen it exposed during the course of the trial. The exhibit of incendiary literature published officially by that organization will have opened the eyes of people who may have thought that Moyer and Haywood were merely leaders in a social movement deserving of a free field. It is apparent that they were not, that there was an inner ring with unbounded power to swing the Federation and to use it for their own purposes, which were not always those of the members. Legal conviction they have escaped, but moral blame for inciting riot and violence they will receive from the larger jury that has been trying them during many weeks, not in Idaho alone, but in every State of the Union.

It is a sad story that we have seen told at Boise. Smoldering class hatreds and despairing violence, brutal rapacity and haphazard crime have been thrown on a screen illumined by the torch of civil war. Above everything, the law has been made to look supremely

weak, for in the effort to ferret the facts, the police is represented not by the organized service of the State but by a private detective agency, which boasted unduly of its accomplishment long before the trial began and failed to make good when put to the test. It is to the discredit of popular government that the detection of wholesale crime and widespread conspiracy should necessarily have to be given into the hands of private detective agencies, instead of a properly organized police. After all, government begins with a proper police force; enforce order and the law can take its course; permit violence and it becomes impossible to apply the law. The riot at Wardner, the murders at Telluride, the dynamiting at Cripple Creek would never have occurred if there had been any sort of a police force composed of capable and faithful men. The community at large wants to attend to its business and will not spare enough time for civic duties; the least it can do is to make certain of a police that will check any disorderly interruption to industrial functions and any assault on the life of those who wish to pursue their avocations. If the senators that debauch the State legislatures in order to get elected, and if the congressmen that sell themselves to railroad companies in order to go to Washington, could be retired and their salaries used for the maintenance of a well organized police and detective service, there might be a great improvement in the condition of life that is labeled civilization.

WE ARE ABLE to state that Dr. David T. Day, chief of the division of Mining and Mineral Resources, has resigned. He has had charge of this division in the United States Geological Survey ever since 1884, when he succeeded Albert Williams, who organized the statistical department in 1880. Dr. Day is succeeded by Mr. Edward W. Parker, who has been his chief assistant, with particular attention to the statistics of the coal industry. Mr. Parker was a member of the Anthracite Strike Commission of 1903 and he is not unknown in journalism. Dr. Day, we understand, is to become petroleum expert, remaining on the Survey in this capacity. The retirement of Dr. Day is apparently another step in the reorganization of the statistical department of the Survey. For many years the collection of data was allotted to a number of special agents, such as Charles Kirchhoff, John Birkinbine, Charles G. Yale, George F. Kunz, James M. Swank, and other men identified with particular industries. Of these only Mr. Yale remains in service, a fact pleasant to chronicle, for he was editor of the MINING AND SCIENTIFIC PRESS for 22 years. Instead of engaging experts in the employ of other agencies, the Survey now utilizes its own officers in the collection of statistics. The work has been allotted to a group of younger geologists of marked ability, headed by Mr. Waldemar Lindgren. On another page we quote the statistical report on copper by Mr. L. C. Graton; next week we shall publish similar figures on lead by Mr. J. M. Boutwell. The work is being done well and is deserving of the cordial support of all those engaged in mining.

Personal.

PHILIP L. FOSTER is in Russia.

JOHN B. FARISH is in New York.

C. W. GEDDES, of Goldfield, is here.

R. S. RAINSFORD, of Salt Lake City, is here.

R. V. NORRIS has arrived here from New York.

F. J. H. MERRILL is still at Llanos, in Sonora, Mexico.

C. M. YEOMANS is about to leave El Oro, to go to China.

CHARLES JANIN has returned to San Francisco from Colorado.

LUCIUS J. BOYD, who is operating in Lovelocks, Nevada, is here with his family.

D. E. BIGELOW is chief mechanical engineer for Bewick, Moreing & Co. in Australia.

PHILIP ARGALL sailed from Queenstown for New York on July 17. He is now at Denver.

WILLIAM A. POMEROY is at Palo Alto, California, on a visit from Chinipas, in Chihuahua.

F. B. REECE has returned from El Oro, Mexico. He will visit Butte and the Cœur d'Alene.

FERGUS ALLAN, superintendent of the Mexico mine, at El Oro, is with Philip L. Foster in Russia.

W. L. HOYT has been appointed general manager for the Tasmania Copper Co., at Leigh Creek, South Australia.

ARTHUR W. JENKS has returned to Portland, on the completion of a mine examination in British Columbia.

MILTON MOSS, of Huntsville, Alabama, has been visiting the mining districts of Utah, Nevada, and California.

VICTOR G. HILLS has returned to Denver from an examination of the Spalding district in Custer county, Colorado.

LESTER W. STRAUSS is at Huaraz, in Peru. He has examined mines in the Cerro de Pasco and Morococha districts.

O. H. PACKER, of Oakland, has been examining and surveying the La Joya quicksilver mine in Napa county, California.

FLETCHER HAMILTON has left the Dairy Farm mine to engage in the sale of mining machinery at Torreon, Coahuila, Mexico.

HORACE STEVENS, of 'The Copper Handbook,' has recovered from a serious operation, and is, we are glad to add, in normal health once more.

SIMONDS & BURNS, of New York, have opened a branch office at Haileybury, in the Cobalt district of Ontario, in order to facilitate work in that region.

THOMAS NEILSON, for many years with the Mountain Copper Co., has resigned and has been appointed metallurgist to the Shannon Copper Co., at Clifton, Arizona.

WILLIAM S. MANN, cyanide manager for the Montezuma Mines Co., of Costa Rica, has resigned to accept the management of the Boston & Oaxaca mines at Tlacolulu, in Oaxaca, in Mexico.

WILLIAM P. MILLER has lately returned to San Francisco from the Parral mining district, Chihuahua, Mexico, where he made an examination of the famous Palmilla mine, owned by Pedro Alvarado.

ROBERT H. RICHARDS recently returned to Boston from six weeks in camp in the White Mtn., where he has been engaged in writing the appendix to his book on 'Ore Dressing.' He is now on his way to the West, and expects to be, for a few days, in Flat River, Mo., about July 27; in Great Falls, Mont., about August 5; in Salt Lake City about August 12; in Denver about August 18 or 20.

WILLIAM C. MADGE, who has been in the employ of the American Smelters Securities Co. for several years in the United States and Mexico, as chief engineer in charge of the design and construction of mills, having just completed a mill at Silverton, Colorado, has gone to Salt Lake to open a consulting engineer's office, where he will make a specialty of mining and ore-dressing plant design and construction.

Latest Market Reports.

LOCAL METAL PRICES—Aug. 1.

Antimony.....	17.00@20.00c	Quicksilver (flask).....	838@89.50
Copper.....	24.00@25.00c	Spelter.....	7.25@ 8.00c
Pig Lead.....	5.35@ 6.30c	Tin.....	43.25@44.75c

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.

Date	Electrolytic Copper	Lead	Spelter	Silver
July 26.....	20 ³ / ₄	5 ¹ / ₄	5.97 ¹ / ₂	69
" 27.....	20 ¹ / ₄	5 ¹ / ₄	5.92 ¹ / ₂	69 ¹ / ₄
" 28.....	Sunday. No market.			
" 29.....	20 ¹ / ₂	5 ¹ / ₄	5.92 ¹ / ₂	69 ³ / ₄
" 30.....	20 ¹ / ₄	5 ¹ / ₄	5.87 ¹ / ₂	69 ³ / ₄
" 31.....	20 ¹ / ₄	5 ¹ / ₄	5.87 ¹ / ₂	69 ¹ / ₄
Aug. 1.....	20 ¹ / ₄	5 ¹ / ₄	5.87 ¹ / ₂	69 ³ / ₄

SOUTHERN NEVADA STOCKS.

San Francisco, Aug. 1.

Atlanta.....	\$ 61	Laguna.....	1.50
Belmont.....	3.10	Little Tonopah.....	.75
Columbia Mtn.....	.58	Manhattan Con.....	.40
Combination Fraction.....	2.27	Midway.....	.90
Daisy.....	1.92	Mizpah Extension.....	.25
Fairview Eagle.....	.68	Mohawk.....	17.00
Florence.....	5.55	Montana Tonopah.....	3.05
Gold Bar (Bullfrog).....	.66	Nevada Hills.....	5.95
Gold Bar (Goldfield).....	.50	Red Top.....	4.00
Goldfield Con.....	8.40	Sandstorm.....	.43
Goldfield of Nevada.....	1.50	Silver Pick.....	.61
Gold Kewanas.....	.65	St. Ives.....	.92
Great Bend.....	.77	Tonopah Extension.....	1.45
Jim Butler.....	.95	Tonopah of Nevada.....	13.00
Jumbo.....	4.00	Tramp Con.....	.42
Jumbo Extension.....	1.87	West End.....	.75

(By courtesy of W. C. Ralston, 368 Bush St.)

COPPER SHARES—BOSTON.

Closing prices.		Closing prices.	
Name of company.	July 31.	Name of company.	July 31.
Adventure.....	2 ¹ / ₂	Michigan.....	13
Ahmeek.....	.75	Mohawk.....	.78
Allouez.....	.41	Nevada Con.....	137 ³ / ₈
Amalgamated.....	85 ¹ / ₄	North Butte.....	77 ¹ / ₂
Arcadian.....	.5 ¹ / ₂	Old Dominion.....	41 ¹ / ₄
Atlantic.....	12 ¹ / ₂	Osceola.....	125
Balaklala.....	.8	Parrot.....	18
Bingham Con.....	14 ¹ / ₂	Phoenix.....	1 ¹ / ₂
Boston Con.....	25 ¹ / ₄	Quincy.....	112 ³ / ₄
Butte Coalition.....	23 ³ / ₈	Raven.....	.....
Calumet & Arizona.....	161	Rhode Island.....	49 ¹ / ₄
Calumet & Hecla.....	.790	Santa Fe.....	.3
Centennial.....	.26	Shannon.....	15 ¹ / ₂
Con. Mercur.....	.39	Superior & Pittsburg.....	14 ¹ / ₂
Copper Range.....	76 ³ / ₄	Tamarack.....	100
Daly-West.....	.15	Trinity.....	197 ¹ / ₂
Franklin.....	.12	United Copper com.....	.61
Granby.....	.....	Utah Copper.....	.44
Greene-Cananea, etc.....	15 ¹ / ₈	Victoria.....	.6
Isle Royal.....	.17	Winona.....	7 ¹ / ₂
Mass.....	.5 ¹ / ₂	Wolverine.....	155

(By courtesy of E. F. Hutton & Co., 490 California St.)

MINING STOCK QUOTATIONS—NEW YORK.

	Closing Prices	
	July 25.	Aug. 1.
Bingham Central.....	1	11 ¹ / ₈
Boston Copper.....	27 ¹ / ₂	25 ³ / ₈
Cumberland Ely.....	9	8 ³ / ₈
Dolores.....	6	6 ¹ / ₂
El Rayo.....	4 ³ / ₄	4 ¹ / ₄
Guanajuato Con.....	3 ¹ / ₂	3 ¹ / ₄
Glroux Con.....	8 ¹ / ₂	8
Greene Con.....	25	25
Nevada Con.....	14 ¹ / ₂	13 ³ / ₈
Nipissing.....	10 ¹ / ₄	8 ³ / ₈
Tennessee Copper.....	46	36 ³ / ₄
Tonopah Ex.....	1 ¹ / ₂	1 ¹ / ₈
Tonopah-Belmont.....	3 ¹ / ₄	3 ³ / ₈
Tonopah.....	13 ¹ / ₄	13 ³ / ₈
United Copper.....	62	69 ¹ / ₄
Utah Copper.....	28 ¹ / ₂	29

(By courtesy of Hayden, Stone & Co., 25 Broad St., New York.)

COMSTOCK SHARES SAN FRANCISCO.

Closing Prices.		Closing Prices.	
July 31.		July 31.	
Alpha.....	.06	Julia.....	.08
Andes.....	.18	Kentuck.....	.10
Belcher.....	.28	Mexican.....	.56
Best & Belcher.....	.87	North Gould & Curry.....	.....
Bullion.....	.20	Ocidental.....	.88
Caledonia.....	.33	Ophir.....	1.00
Challenge Con.....	.20	Overman.....	.12
Chollar.....	.10	Savage.....	.58
Confidence.....	.65	Scorpion.....	.06

General Mining News.

ARIZONA.

GILA COUNTY.

The Old Dominion is turning out a large amount of copper from the five furnaces running at the smelter. L. D. Ricketts, who is still consulting engineer for this company, and John Langton, mechanical engineer for the Phelps-Dodge company, have been in Globe considering the erection of the new central electric power-plant and new equipment at the mine. The new pumps may be installed in A shaft instead of C shaft. Construction work and mine development are progressing favorably. No. 5 cross-cut on the 14th level is well started and should cut No. 1 sulphide vein within a short time. The double-compartment winze is 75 ft. below the 14th level and is going down as fast as three shifts can sink it. All the important stopes look well and there is a steady increase in ore blocked out.—The new three-compartment shaft, to take the place of the old incline shaft on the Gibson property, has been started by sinking from the surface and raising from two of the levels.—At the Globe Consolidated, good progress is being made in the Mallory shaft, which is now 725 ft. deep. The Gem shaft is 820 ft. deep, still in diorite.—There is still vein-matter showing in the shaft of the Arizona-Colorado mine, which is 650 ft. deep.

GRAHAM COUNTY.

There is a great deal of talk about the consolidation of the Arizona Copper Co. with the Shannon Copper Co., and such a move is not unlikely. J. G. Hopkins has gone to Scotland on behalf of the Arizona Copper Co. to consult with the Shannon shareholders and officers regarding the merger.—The San Juan mine is in the regular shipping list, a number of cars of concentrate having been shipped recently. A large force of miners is employed, and the 30-ton mill is running day and night. They are at present cutting through to the main body of ore from the 360-ft. level, the vein having been first uncovered at the 260-ft. level, where it is said to be 25 ft. wide.

MARICOPA COUNTY.

A company has been organized by Emil Holden to work a placer claim on the Hassayampa river, near Hot Springs. Water will be conducted three miles through an eight-inch pipe.—The mill of the Interior M. & T. Co. on the Big O'Brien property is running. Jas. D. Loughery, the president, and the board of directors live at Pittsburg.—C. C. Harris, of Findlay, Ohio, has been doing some mining in the Big Horn district, and has purchased 10 claims in that country besides having located numerous other claims, and in all has over 100. The ore in that district is gold, silver, and copper, with copper predominating. It has long been known that the district west of the Hassayampa is pretty well mineralized, but it is only of late that people have been doing any prospecting and opening up of claims.—J. C. Dobbins, consulting engineer of the Wallapai Copper Co., whose properties are near Gillette, just south of the Yavapai county line, reports that the company has 53 men at work and that prospects for a new and important copper mining district in that portion of the Bradshaw Mtn. are excellent. The holdings of the company cover 160 acres, upon which a patent was recently secured from the Government. The deepest shaft is down 262 ft., and the operations will be confined to driving and cross-cutting until a new boiler is installed.

MOHAVE COUNTY.

The Arclise Copper M. Co., operating on a group of 12 claims north of Kingman, has made a third payment on the purchase price of the properties. The tunnel is in over 500 ft. and will soon cut the vein on which a shaft was sunk 100 ft., showing copper ore.—Thomas McMahon is working on the old Pixley mine at Layne Springs, and is taking out some ore. The de la Fontaine mill is to be started again. Work is progressing on the Golden Eagle group, in Mineral park, owned by Steve Tyler.—A clean-up from a week's run at the Goldroad mill amounted to about

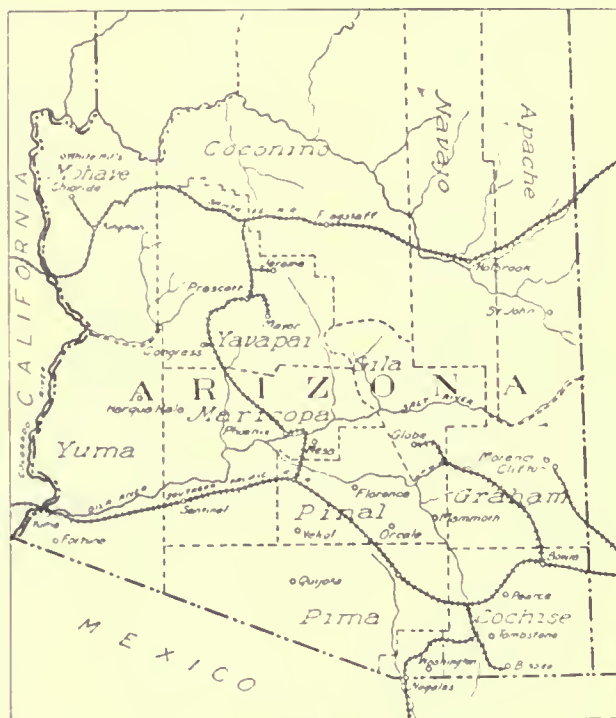
\$30,000 in gold. Good ore is being opened in the lower levels.—A steam boiler is being put in at the Treasure Hill mine, and the shaft will soon be unwatered by pumps.

PIMA COUNTY.

Ferris Fitch, general manager of the Weldon Copper Co., has completed negotiations for a 30-stamp mill. The company has a force of more than 50 men employed at its mines on the Weldon properties.—There are 5,000 tons of ore at the Omega property, in the Helvetia district, ready for shipment, but it is difficult to get teams to haul to Vail station. There is said to be a good demand for Omega ore at Globe for fluxing.

PINAL COUNTY.

The J. Baldwin syndicate, of which J. P. Harrington is the president, has taken over the Sultana mine. The purchase price was \$90,000, and they are shipping ore that runs up to 20% copper. They are preparing to sink a vertical shaft and to build an aerial tram to a concentrating plant, and from that down to the railroad. There are several thousand tons of low-grade ore on the Sultana dump which it will not pay to ship to the smelter that will be concentrated on the ground when the plant is put in. The Sultana



Map of Arizona.

claims extend over about 300 acres and the company is figuring on buying 600 more acres.—New York capitalists are negotiating for the purchase of a group of claims at Superior, owned by Mesa prospectors.

YAVAPAI COUNTY.

(Special Correspondence).—The Commercial Mining Co., operating in the vicinity of the Mt. Tritle property, in Maxton district, is driving the Senator tunnel, which, if it is driven on through the mountains, will be over two miles in length. It is now in about one mile, and work is being pushed. The tunnel is a fine piece of work, and is being driven to enable the company to develop and mine the ores from several veins that are known to exist on the property. Aside from developing this property, the Senator tunnel will be of benefit to the other mines in the district.—The Storm Cloud company is pushing development work upon the same system of veins that show on the Commercial ground, and it is shipping ore regularly to the Humboldt smelter. The activity of the Commercial company will probably mean a smelter for the Maxton district, and a railroad. The Storm Cloud company and the Mt. Union company may have reduction plants of their own. There is plenty of water in all parts of this belt.—The Mt. Tritle Copper Co. has one of the best properties in the district. Its ground is on the same veins that are being opened by the Senator tunnel, and the Mt. Tritle vein may

be an extension of either the Senator No. 1 or 2 vein. The ore is similar. The Mt. Trille is driving a tunnel 600 ft. above the Senator tunnel level. In the veins sulphides are found at the surface. The ore contains pyrite, chalcopyrite, free gold, and silver sulphides, and the gangue is quartz, making an ore that could be handled by concentration.

Prescott, Aug. 1.

(Special Correspondence).—Development work is progressing on the Little Daisy, owned by J. J. Fisher.—The Jerome-Verde Mining Co., under the management of C. H. Putnam, is making preparations for the development of that property. A wagon-road is being built, and the force of men will be increased. This company has plenty of money for development purposes, and no stock is for sale. The showing on this property is excellent, and development will be watched with interest.—The work of unwatering the 1888 shaft of the Hull Copper Co. is progressing, and sinking will be resumed in a short time.

Jerome, July 17.

The United Verde smelter at Jerome has been temporarily closed while the overhead crane track was being repaired, not on account of a cave-in from the surface, as was reported.

Splendid headway has been made during the past four months in the lower tunnel of the United Verde at Jerome. In 117 days the tunnel was advanced 1,058 ft., being an average of about nine feet per day, although hand-drilling was done for the first 400 ft. At present two machines are being run for two 8-hr. shifts, with three shifts of muckers working. The tramming is done by mules. The tunnel will be 7,000 ft. long and will tap the mine at a depth of 1,000 ft. It is 7 ft. high, 9 ft. wide at the bottom, and 7 ft. at the top, in the clear, and is heavily timbered throughout. The portal is on Bitter creek, a mile below Jerome.

CALIFORNIA.

EL DORADO COUNTY.

A deal is pending for the sale of the Ada mine by E. F. Porter.—The Standard Unit mine in Coloma canyon has resumed operations with Sam Beers as manager.—The Wolff property is being opened by Chris Raabe and a mill may be built.—The stamp-mill at the Hanson mine is being repaired and will be started.—The new 10-stamp mill at the Vivian mine is nearly completed.

A good body of quartz has been struck in the Isabel mine, owned by M. P. Bennett. The property was formerly called the Blue Lead and was a surface producer of gold.—W. K. Reed is making a survey from the Arterburn group of claims to the canal of the Leon Lake W. & P. Co., with a view to bringing water to the properties, which lie at the serpentine contact, about three miles south of the Three Queens, Josephine, and Trench mines.—C. D. Wilkinson and A. W. Flint are in charge of the work on the Alpine mine.

NEVADA COUNTY.

The water has all been pumped out of the Morning Star mine at Badger hill. Oscar F. Greeley has reported on the property.—The Norambogua tunnel has been cleaned for its entire length, and it is ready for the rails which should arrive soon. Work on the new air shaft is progressing rapidly.—The Cold Spring Co. expects to have the tunnel of the Buckeye quartz mine into the shaft at the 125-ft. point, within a short time. After the connection with the shaft is made, the tunnel will be continued on the vein for 2,000 ft. into the Cold Springs ground, in order to prove it thoroughly.—The water has been lowered to the 300-ft. level in the Banner mine, and the workings will be dry within a month. Bulkheads will be built on the 300 and 600-ft. levels to hold back the water.—A good copper vein has been struck in the South Yuba property of the Omaha-California company, of which Matthew Daugherty is the superintendent.

COLORADO.

SAN JUAN COUNTY.

Three carloads of concentrate are shipped daily from the Gold Prince mill at Animas Forks to the Durango smelter.—A force of men is working in the Domingo tunnel at

Eureka, which has been idle for eight months. Samuel Davis is the local manager.—A. A. Beard has taken a lease and bond on the South Democrat mine in the Animas Forks district. This is an old property that has produced considerable ore. The old mill will be remodeled and started.—Operations have been started by the Peerless San Juan M. & M. Co. on the Dr. Beaton properties in Minnie gulch. A new electric compressor has been set up, and three machine drills are working. Ben Dunstan is the foreman. Shipments will start at once to the Durango smelter, and a mill will be built this fall.—The Ross smelter had to close down for a week on account of a wash-out on the Silverton Northern railroad, but it is running again.—J. N. Kloster has resumed work on his Gold Bug claims in Stony pass. One tunnel is 75 ft. long, and a second one is 350 ft. long. He will ship about four carloads per month. The new Detroit & Colorado tramline will soon be finished, whereupon shipments will start.—A force is working on the property of the Gold Mines & Power Co., at the head of Elk creek.—The shaft of the Dakota Mining Co. in Boulder gulch is down 100 ft., and a contract will be let for another 100 ft. John Martin is the manager.—The Astor Mining Co. has resumed work on its properties at the mouth of Picayune gulch. They are working on the Toltec vein, and have been developing the property for years.—Eastern capitalists are negotiating for the purchase of the Parker, Excelsior, Protection, Avalanche, Copper Falls, Republican, and several other claims in Boulder canyon.—The upper tunnel of the Nugget Con. M. Co., operating in Maggie gulch, is in 250 ft., while the lower tunnel is 100 ft. long. Good ore has been struck, which will be shipped as soon as the wagon-road is completed.—An 800-ft. tunnel has been driven by the Bullion Bar M. Co. in Maggie gulch. C. P. Campbell, of Colorado Springs, is the president, and T. E. Major the treasurer.—All of the mines at Red Mtn., in which George Crawford is interested, will be started up again. They are the Red Mtn. R. M. & S. Co., the Blue Bell M. Co., and the Gold Lion M. Co. The first property is drained by the Joker tunnel, which has been driven to within 600 ft. of the Genesee shaft, and will be run farther to cut it 800 ft. below the Genesee tunnel.

IDAHO.

SHOSHONE COUNTY.

Machinery is on the ground at the Charles Dickens mine near Osburn, and with its installation the capacity of the mill will be doubled. It will be set up at once, and the work is expected to be completed soon. The capacity of the mill is now 75 tons per day. Two jigs and one table will be added to the equipment. The property is in excellent condition, with bright prospects. Samples of the ore run well, and do not show much zinc. Six samples of concentrate averaged nearly 70% lead, and show half an ounce of silver to each per cent of lead.—The concentrator at the Stewart mine in Government gulch, near Wardner, has been completed, and will have a capacity of 150 tons daily. The concentrator is near the mouth of the Silver King tunnel, and it is expected to handle the ores from the Heinze properties, including the Silver King, Stewart, and Crown Point. The Senator Stewart already has several thousand tons of ore on the dump ready for the concentrator. A tunnel is being run on the Silver King east toward the Senator Stewart, and will do the prospect work for both mines below the depth of the main tunnel on the last named.

NEVADA.

ESMERALDA COUNTY.

(Special Correspondence).—For the week ending July 27, the Goldfield properties shipped 3,143 tons of ore valued at \$345,250. Of this amount 480 tons, valued at \$48,000, was shipped to the smelter by the Mohawk; 475 tons, valued at \$23,750, was treated at the Combination mill; and 2,188 tons of ore received from the following mines by the Nevada Goldfield Reduction Works: Mohawk Florence, 161 tons; Mohawk Jumbo, 570; Little Florence, 80; Mohawk Combination, 484; Sheets-Ish dump, 23; Red Top, 247; Hayes & Monnette dump, 221; McNaughton lease, 95; Mohawk, 120; Combination Fraction, 29; Higginson lease, 98; Codd

lease, 33; Sandstorm, 21 tons. Total, 2,188 tons, valued at \$275,500.—The Frances Mohawk lease on the Wedge has struck a shoot of ore at a depth of 360 ft. The vein is three feet wide and runs well. The shaft will be sunk an additional 100 ft. and a station cut.—The Codd lease on the St. Ives has ore on the 100-ft. level. The shaft is being put down 400 ft.—A good body of ore has been struck near the 300 level in the shaft on the Great Bend No. 2, at Diamondfield.—A vein, carrying low-grade ore, has been encountered in the Happy Hunch mine, eight miles east of this city. At the Queen of Sheba, in the same district, a 100-ft. shaft is being sunk. Some ore has been found in the Red Hills, and development is steadily progressing.

Goldfield, July 27.

HUMBOLDT COUNTY.

(Special Correspondence).—Two shafts and two cross-cut tunnels are being driven on the Brown Palace, and two shafts are going down on the Dreamland, where the vein is stripped for 200 ft.—The Rosebud-Rattler is driving an east drift from the tunnel with the expectation of striking the ore-shoot exposed on the surface.—A vein has been cut in the 425-ft. tunnel in the Golden Anchor, and is being driven on.—A shaft is being sunk on the Golden Triangle. A vein carrying silver is being developed in the Durango Girl.—The shaft on the Warner-Stewart is down 75 ft. A small vein is being developed.—A 12-in. vein carrying silver, has been struck in the White Cat.—The shaft in the Five of Diamonds has exposed a vein.—The Seven Troughs Piute M. Co. is developing its lease on the Boilermaker, and the shaft is down 50 ft. The company has secured a new lease on the Seven Troughs King and will commence operations at once. John B. Newman has been appointed general superintendent of the Seven Troughs Piute.—The Gold Quartz company is sinking a shaft on its most promising claim, and has leased parts of its holdings.—A syndicate of Butte capitalists has been organized to take over the group of claims owned by the Cusick syndicate near Tenabo.

Rosebud, July 25.

LYON COUNTY.

(Special Correspondence).—The Ramsey-Comstock mine is to ship some ore to the Utah smelters, the first consignment to be sent by August 1. The ore occurs in a porphyry dike that is 70 ft. wide and has been driven on for several hundred feet. Driving on the levels is progressing steadily and a mill is to be erected.—Another property having some ore is the Walkover mine, that lies about two-thirds of a mile west of the Ramsey-Comstock, and has a dike that contains surface ores. A small vein of ore was encountered in a prospecting tunnel at a depth of 25 ft. from surface.—On the east extension of the Ramsey-Comstock the Ramsey-Ophir M. Co. has uncovered a tunnel 60 ft. from the surface. They plan to sink a 500-ft. shaft in the hanging wall.—The Ramsey-Consolidated M. Co. is cross-cutting at the 300-ft. level on Dago No. 2 claim. The workings are below water-level, in the sulphide zone, and will be over 500 ft. from the apex of the dike when that point in the cross-cut is reached. On the adjoining Dago No. 1 claim, a prospecting tunnel is being driven.—The Ramsey-Bonanza company has uncovered some ore with a shaft and cross-cuts, at a depth of 100 ft. from surface, and has ordered some machinery and equipment. Two veins are exposed.

Ramsey, July 22.

NVE COUNTY.

(Special Correspondence).—The development of the properties of Manhattan is proceeding slowly. Some milling ore has been found in the mines on Mustang hill, at depth, and some exploration has been carried on below the water-level, or about 250 ft. down.—A little tellurium ore has been encountered in the Thanksgiving mine. Ore was first encountered at 210 ft. and was sunk upon to the 236-ft. level, when a steam-hoist was installed, sinking resumed, and at a depth of 252 ft. a little ore is still showing in the shaft, which is in highly silicified sedimentaries.—The Manhattan Ore R. & R. Co. is building a small mill on Mustang hill. It was designed by F. L. Bosqui, and is being built under his supervision. The treatment determined upon is to stamp the ore, amalgamate, fine grind in tube-mill, treat with secondary amalgamation, and then agitate and

filter the product in the Butters patent vacuum filter. The stamps are erected on the masonry mortar blocks, the tube-mill is in place, excavation is about completed, masonry retaining walls are about done, and all material to complete the plant is in transit, and it is hoped to complete the plant in the early fall. The initial capacity will be 60 tons per day.

Manhattan, July 23.

NEW MEXICO.

GRANT COUNTY.

The Comanche M. & M. Co. is erecting a new 300-ton furnace at its smelter. The engine and blower are in place and the machine-shops are in operation. The furnace was made by the El Paso Smelter Supply Co. The Comanche company's concentrator is treating about 100 tons of ore per day, from the Pinos Altos mines, and the capacity of the plant will soon be doubled.

SIERRA COUNTY.

Some work is going on in the Hillsboro district. The Sierra Consolidated M. Co. is completing a steel-frame-100-ton stamp-mill, and 50 men are employed at the mine.—



Map of New Mexico

The Ready Pay Reduction Co. is putting in a Huntington mill to treat its low-grade ore.—The Empire Gold M. Co., which has produced for 20 years, has a 20-ton mill steadily at work, and ships high-grade ore to the El Paso smelter, employing 35 men at the mine.—The Hillsboro Consolidated M. Co. is cleaning out its shaft and tunnels and will produce ore again.

TAOS COUNTY.

In the Burro Mountain district, the Copper Gulf Development Co. has installed new pumps in the Virginia and Copper Gulf shafts, which are down to water-level, and sinking will be resumed.—The Ocala Copper Co. has resumed work on its property, under the direction of R. P. Thompson. The shaft is down 185 ft. and shows low-grade carbonate ore.—The Burro Mountain Copper Co. has opened a body of ore 400 ft. long running 4% copper. It has also sunk a shaft on the Boston claim, which is bottomed in ore.—The Tyrone Development Co.'s shafts No. 1 and 2 are still in ore at a depth of over 300 ft.—The Santa Fe railroad will build a spur to this district.

TRES PIEDRAS COUNTY.

(Special Correspondence).—The 500-ton smelter of the Southwest S. & R. Co. is almost completed, and the furnaces will soon blow in. The tramway from the Lucky Flat district to the ore-bins is nearly completed.—The First National is driving the tunnel on the Ruby, and is preparing to install a 100-ton placer plant.—The shaft on the

Cuprite is down 150 ft., and several shipments have recently been made.—The Turquoise Copper, and Hershberger properties are shipping ore to the El Paso smelter.—The Southwest company is installing a steam plant and drills at the By-Chance, and will thoroughly develop the mine. The ore carries gold and copper.—An eight-foot vein, carrying gold and copper, has been struck in the 50-ft. shaft in the Shamrock.—The Electric M. Co. is installing a placer plant. The pipe-line from the Sacramento river is completed, and the 25,000,000-gal. reservoir is nearly filled. Water is also being obtained from the Valley shaft of the Lucky and other mines.

Orogrande, July 23.

SOUTH DAKOTA.

LAWRENCE COUNTY.

The Golden Placer M. & M. Co. has purchased the Kicking Horse placer ground of 40 acres, in Blacktail gulch, from George Johnson and Chris Godfrey. The property has been a producer for years.—Stockholders in the Victoria Mining Co. have recently visited the property in the Ragged Top country below Iron creek. Good ore is being developed. A good deal of new machinery has been installed at the Keystone, including boilers and an engine, Wilfley tables, and an air-compressor. A large force of men is at work at the mines, advancing 11 shafts and five tunnels.—The charter of the Segregated Iron Hill M. Co. has expired by limitation, so the surviving directors become trustees. A new corporation has been formed to take over the old holdings, and O. P. T. Grantz is president and D. A. McPherson treasurer.—A good vertical shoot of ore has been discovered in the American Eagle property. A new 200-ton cyanide mill is being built.—The Lundberg-Dorr-Wilson mill has started again, after having been idle since the strike last winter, and is handling 90 tons per day.—An English syndicate has taken a 60-day option on the Two Bit property, from S. R. Smith and A. J. White.—A strike of good ore has been made on the ground of the Echo Mining Co., in the Garden City district, at the 300-ft. point in the tunnel that is being run in a southwest direction. A. J. Simmons is the manager and the stock is owned principally in New Hampshire.—The Columbus Con. M. Co. is offering unsecured creditors stock of the company for their claims, on the basis of 25c. per share. The office of the company is in Chicago, Roswell A. Breed is president, and Arthur J. Kirkwood treasurer.—The Branch Mint Co., at Galena, will soon start its 120-stamp mill and treat 500 tons of ore per day from the Hoodoo shaft. A railroad is being built from the mine to the mill and a large force is employed.—The Imperial company has acquired the ground of the Dakota Mining Co. in the Bald Mtn. country.—The North Homestake Co. is hauling coal to its property from Blacktail gulch, although it has not been announced when they will start the mill. The diamond-drill work continues from the levels at the bottom of the 225-ft. shaft.—The Lady of the Hills ground, on the antimony belt at Silver City, has been bonded to New York parties. The 5-stamp mill of the Grand View M. Co. on Rapid creek is working steadily, after a short shut-down.—The directors of the Success G. M. Co. have decided to build a mill on their property near Roubaix.

The water in the Homestake mine is below the 600-ft. level, and stoping has started on the 500-ft. level, over 1,000 men being at work and the mills running to their full capacity. When the water is lowered to the 800-ft. level the big pumps at that point will be started.—Work at the Puritan Mining Co.'s property, at the head of Strawberry gulch, near Deadwood, will soon be resumed, as the necessary financial backing has been secured. There is a 20-stamp mill on the property, with a cyaniding equipment, which was built three years ago. Vanners will be put in to work the Wilfley tailing over again.

PENNINGTON COUNTY.

The Standard smelter at Rapid City may be run again if C. H. Fulton succeeds in interesting Eastern capital sufficient to develop some of the old properties near Galena. The plant was forced to close down because of the lack of ore.

WASHINGTON.

FERRY COUNTY.

(Special Correspondence).—It is expected that the Winnipeg adit will be through to the old workings by August 6. It is advancing nine feet per day.—The adit of the Blue Bell-Belcher has tapped a vein of oxidized quartz ore which shows stains of copper, but has not yet touched the iron sulphide vein.—Preparations are being made to work the Oregon & Washington mine in the San Poil district.—The adit on the Vesuvius mine, near Keller, has tapped and drained the shaft on the vein, and some high-grade copper ore has been uncovered.—The Copperopolis M. & L. Co. has sent mining supplies to the Last Chance mine, in the San Poil district, and plans development on a larger scale than usual.—The Gold Seal M. Co. is erecting a boarding house at the Gold Seal mine, on Bridge creek. Ample capital has been raised for development. William Gallup is in charge at the mine.—The Spokane and St. Lawrence claims of Camp Gilbert, in the Twisp district, have been bonded to an Eastern company, organized with a capital of \$7,000,000, and a project is on foot to build 100 miles of electric railway, in conjunction with a smelter of 1,000 tons per day capacity. This company proposes to buy a number of claims to keep the smelter operating to its full capacity. It is stated that the intention is to construct the railway from Twisp to tidewater on Puget Sound, with a branch from Potero, up the Twisp river, to Robinson. A custom rate for freight and treatment of \$3.50 per ton is possible. The Copper World Extension M. Co. is planning improvements to get its ore down from the summit of Palmer Mtn., and ship to the smelters. The Eastern stockholders are well pleased with the condition of the mine.—A new gasoline hoist at the Ben Harrison mine, at Chesaw, is working satisfactorily. At a recent stockholders' annual meeting Basil Doerhoefer, George Holzbog, Wm. A. Roberson, C. J. Weibel, John Sidler, George Edgington, and James P. Blaine were elected trustees for the ensuing year.—The machinery for the Molson Mining Co.'s new mill has arrived and is being installed. The trustees and executive officers elected July 8 were D. W. Dart, president, and general manager; W. B. Van Wormer, vice-president; C. W. Smith, secretary; M. A. Smalley, treasurer, and H. N. Michel, M. E. Schreck, and H. F. Beery, trustees.—The Grant Consolidated Copper Co. has concluded to drive an adit 1,500 ft. through Copper Mtn., to develop three veins at depths varying from 300 to 800 ft. Ore shipped from the Grant has brought smelter returns approximating 6% copper, and \$4 in gold and silver per ton.—In the case of the Mountain Sheep M. Co. v. the Ruby Mining Co., in which the complainant alleged that the defendant had taken ore from its ground, a decision was rendered by Judge E. R. Steiner in the Superior Court in favor of the defendant.

Republic, July 30.

George Belt, resident agent for the plaintiff, recently appeared before the State Supreme Court in an effort to compel the Secretary of State to file the articles of incorporation of the Amalgamated Republic Mines Co. The company, organized under the laws of Arizona, has a working bond on practically all the mines in the Republic district, north of Spokane, to treat the ores by a new process. The Secretary of State has refused to accept the articles of incorporation on the ground that they permit the company to deal in real estate. The company has appealed to the Supreme Court for a writ of mandamus to compel him to permit the filing of the articles in their present form. The matter is now pending before the Supreme Court until the attorneys for the State have filed a brief in answer to the company's arguments.—Changes have been made in the management of the Belcher company, which owns the Belcher properties near Republic camp, north of Spokane, where development work is being done by several concerns. J. H. Harper has resigned as superintendent. The property, which has been closed since the beginning of the year, will open in August, when the company will begin shipping. The new directors are: J. A. Anderson, of Rosalia; Judge Chadwick, of Colfax; C. H. McNaughton, of Winniepeg; Hugh Armstrong, of Portage, La Prairie

Mark Merritt and J. E. Kennedy, of Rosalia, and R. N. Murphy, of Detroit. They will meet in Spokane next month to elect officers.

STEVENS COUNTY.

(Special Correspondence).—The British Columbia Copper Co. is shipping approximately 100 tons of ore per day from the Napoleon mine, which assays about \$4 per ton in gold, silver, and copper, 20% sulphur, and from 40 to 45% iron. T. L. Greenough & Bros. have taken a bond for a controlling interest in the Butte & Chief mine, in Pierre Lake district. Active work on the property will be done with two shifts under Miles McNally, the owner.

Republic, July 30.

BRITISH COLUMBIA.

Shipments from Rossland for the week ending July 20 were below the average, due to a lay-off on Miners' Union day, and the burning of a bridge on the Great Northern railroad. The Centre Star shipped 3,600 tons; Le Roi, 2,100; Le Roi No. 2, 420; and the White Bear, 175 tons of ore. Total, 6,295 tons.—At the Centre Star, the development work on the Idaho continues and indications seem to show that this may be one of the most valuable properties of the Consolidated company. The drift toward the Idaho is in 220 ft. The Iron Mask furnishes good shipping ore.



Map of Part of British Columbia.

—At Le Roi, the development in the territory west of the Josie dike continues and ore-shoots are being developed on four levels there. Driving is being done east and west on the lowest level of the Spitzee.—In the California tunnel of the California-Giant a station is being cut preparatory to starting a winze, and on the lower level of the Giant driving is in progress.

The Trail smelter received during the week 5,177 tons of ore. In addition to shipments from Rossland the following contributed to this tonnage: Snowshoe, Phoenix, 411 tons; Victoria, Nelson, 149; St. Eugene, Moyie, 385; North Star, East Kootenay, 185; Planet, 187; Arlington, Erle, 25; and Sunset, 21 tons of ore.—At Le Roi smelter at Northport 2,100 tons of ore were received. Three furnaces are handling 600 tons per day.

The Boundary shipments for the week were: To Granby smelter from Granby mines, 4,489 tons. To B. C. Copper Co. smelter from Mother Lode, 5,246; from Snowshoe, 2,930; from Emma, 162; from Oro Denoro, 1,907 tons. To Dominion Copper Co.'s smelter from Brooklyn, 1,419 tons; from Rawhide, 2,444; from Sunset, 945; from Mountain Rose, 140 tons. To Trail smelter from Snowshoe, 1,030 tons. Total shipments for week, 36,713 tons, and for year to date, 610,464 tons. During the week Boundary smelters treated ore as follows: Granby smelter, 19,691 tons; B. C. Copper Co.'s

smelter, 10,430; Dominion Copper Co.'s smelter, 4,949 tons. Total district treatment for week, 35,040 tons, and for the year to date, 599,228 tons.

The shipments of ore and receipts of smelters for the week ending July 20 were: From the Boundary district, 36,154 tons; Rossland, 5,546; and districts east of the Columbia river, 2,772 tons of ore. The smelter receipts were: Grand Forks, 20,489 tons; Greenwood, 10,083; Boundary Falls, 4,949; Trail, 5,117; Nelson, 110; Northport, 1,818; and Marysville, 600 tons of ore. Total for the week, 43,166, and for the year to date, 800,725 tons of ore.

There is still a shortage of miners in the Boundary region, but more men are coming in daily.—The Granby Consolidated company is planning to increase its smelter capacity from 3,000 to 4,000 tons per day. The company is beginning to exploit the claims recently bonded from the Amalgamated Copper Co. of Phoenix, which are superintended by Charles Biesel.—The British Columbia Copper Co., owning the Mother Lode group of mines and the smelter at Greenwood, has declared a dividend of 25c. per share. It is thought that the company will now pay regular quarterly dividends amounting to \$1 per share per year, as the affairs of the company are in a prosperous condition, and the equipment and mine are in the best of shape.—Diamond drilling is being continued at the Elkhorn mine. Contracts have been made for Coleman coke by the International Coal & Coke Co., with the B. C. Copper Co. and the Dominion Copper Co.—The survey has started on the five-mile aerial tramway from the Dominion Copper Co.'s Phoenix mines to the Boundary Falls smelter.—It is rumored that instructions have been received from England to unwater the Carmi mine.—The Granby company has let a contract for a 200-ft. raise from the face of the Curlew tunnel. The new crusher for the company's Gold Drop mine has been shipped from Quebec, and work has started on grading for the crusher and ore-bins. The present ore-bin will be moved to the mouth of the Curlew-Gold Drop tunnel.—The Phoenix syndicate that has a bond on the Le Roi-McKinney mine, west of Rock creek, has proved the existence of a large orebody, after two months' work.—At Slocan, shipments of silver-lead ore will probably be curtailed for some time, as the Nelson smelter has notified the companies that no ore will be accepted, which leaves only the Trail smelter, of small capacity, to handle the output.—In East Kootenay, a good tonnage of silver-lead ore is produced, the principal shipping mines being the St. Eugene at Moyie, and the Sullivan and North Star at Kimberley. The Stenwinder will probably be a shipper for another year. The lessees who unwatered the Cariboo last January, are working 18 men, and are stoping and operating the mill.—Control of the Crow's Nest Coal Co., operating in the Boundary country, at Michel, Coal Creek, and Morrissey, has been acquired by James J. Hill, president of the Great Northern Railway Company, and Jay P. Graves of Spokane, president of the Inland Empire Electric Railway system, the latter securing 8,000 shares, which with 45% of the stock owned by Hill, give the Great Northern control. This will give the railroads and the Granby smelter a supply of coke and steam coal. This company has mined 720,449 tons of coal during the past year, and has produced 189,385 tons of coke.

NICARAGUA.

The following are some of the properties and their equipments in the Pis-Pis district: The Siempre Viva has a 20-stamp mill. S. D. Spellman is president and Samuel Weil the treasurer. The Lone Star, of which Norman McInnis is president, has 20 stamps. The Concordia, owned by N. J. Martin, is dropping 10 stamps, as is also the Constancia of the Nicaragua Gold M. Co. The Neptune has five stamps and is owned by Joseph Lapierre. The Bonanza, Mars, Minnesota, San Antonio, and Santa Rita mills are all equipped with Huntingtons.—In the Prinzapulea district, the La Luz y Los Angeles company, of which Thomas B. Riter is president and W. M. Rees treasurer, is operating, and the Monte de Oro property is equipped with a Huntington mill.—The Nicaragua property, in the Great River district, is owned by William J. English.—In the Siquia district the Topaz property is equipped with 20 stamps. W. H. Brown is the president and manager.

Special Correspondence.

London.

Indian Mining.—Good News for Deep Workings.—The Great Boulder Mine.—A Fine Record.—Dividends From Camp Bird and El Oro.—News From Mexican Mines.

The Mysore Gold Mining Co. has issued interesting information to the shareholders. The circular alludes to the developments at Edgar's shaft, as advised in the following cable messages from the mines: "Have met with quartz Edgar's shaft at a depth of 2,370 ft. The quartz is 4 ft. wide; assay value, 17 dwt. per ton. Intersected east part of lode Edgar's shaft at a depth of 2,405 ft.; 3 ft. wide; assay value, 1 oz. 12 dwt. per ton." Edgar's shaft, which is vertical and measures 18 ft. diam. inside the brickwork, was commenced some years ago with the object of striking the Champion lode at an estimated depth of 2,500 ft. from the surface. The lode is in two parts, designated the 'western' and 'eastern.' The western portion, as seen above, was encountered at a depth of 2,370 ft. and the eastern at 2,405 ft. In confirming the first cablegram, the acting superintendent writes: "The lode averages 4 ft. of solid quartz, a few of the samples from which gave by assay over an ounce of gold per ton; the average of 20 assays, however, was 17 dwt., as stated in the cable message." The latest message advises that the eastern portion was 3 ft. wide, worth 1 oz. 12 dwt. per ton. The vertical depth at which the eastern part has been cut is some 160 ft. below the horizon of the deepest level at Ribblesdale's shaft, namely, the 3,526 ft., measured upon the inclination of the lode, and upon Edgar's shaft reaching 2,500 ft., this section of the property will be three levels, or 300 ft., deeper than the 3,526 at Ribblesdale's. The directors point out that the importance of these discoveries will be obvious, proving, as they do, the persistence of the Champion lode in depth with great width and value. It is proposed to continue the sinking of Edgar's shaft vertically to a depth of 2,550 ft., and then to carry it down approximately on the dip of the vein. The equipment of the shaft will shortly be undertaken, during which communication will be effected with some of the deep levels from Ribblesdale's and Tennant's, and on the completion of the equipment the haulage of quartz through Edgar's will at once commence. This shaft will become in the future the principal hauling centre and prove of immense benefit to the company by reason of the facilities which it will afford for the rapid and economical transmission of ore to the surface and the conveyance of the men to and from the scene of operations. The directors add that the deepest levels at Ribblesdale's, Tennant's, and McTaggart's continue in rich ore, and they anticipate when the time shall have arrived for them to issue their next annual report to the shareholders, they will be in a position to state that the year's operations have again been of a most satisfactory character and resulted in a substantial addition to the large reserve of payable ore already existing at December 31 last.

Another Indian gold mine—the Nundydroog—is showing signs of improvement, an important point being the winze below the 2,150-ft. level north of Kennedy's shaft (127 ft. north of the shaft), where the quartz is reported to be 2 ft. wide, assaying 2 oz. per ton. Another pleasing feature is the excellent appearance of the developments in the 1,900-ft. south rise (435 ft. from the shaft), on the western lode, where the quartz is reported to be 2½ ft. wide, worth 2 oz. per ton. In the 230 ft. south from south cross-cut east (619 ft. from the North shaft),

the side lode is still opening up well. The drift has been continued for 52 ft., and the latest advice states that the quartz is 1 ft. wide, assaying 1½ oz. The drift has revealed high-grade ore throughout. The side drift from the 1,900 ft. north (180 ft. from the Richards shaft) shows quartz 1 ft. 13 in. wide worth 2 oz. per ton.

At the thirteenth annual general meeting of the Great Boulder Proprietary Gold Mines, Ltd., the chairman, George P. Doolette, proudly claimed that the Great Boulder remains the premier mine of Western Australia and one of the greatest gold mines of the world. He reminded the stockholders that in a little over 12 years it has produced over £5,250,000 sterling in gold, and has paid over £2,500,000 in dividends, and he said he could not see why during the next 12 years it should not maintain that rate of production and percentage of profit. During the year under review they had treated 149,940 tons of ore in addition to 28,597 tons of tailing for a money value of £554,797, as against 132,052 tons of ore and 31,842 tons of tailing, which gave £545,087 sterling for the previous year, and, notwithstanding this large output they have added to their ore reserves during the year nearly 100,000 tons; so that the ore developed during the year has been, in round figures, 250,000 tons, the average value being well maintained. The chairman thought it would be interesting reading to the shareholders, as they go through the reports, to see the splendid developments that have taken place at the different levels below the 1,300 ft., where the tonnage has been enormously increased and the average values more than maintained. The upper levels show a somewhat decreased quantity of ore, but that is owing to the extensive stoping that has taken place in these levels to keep pace with the requirements of the mill. Mr. Doolette said that the previous year had been a record year, but this year they had beaten the record, in the tonnage treated, in reduction of costs, in the profit made, and in the ore developed—and although the large additions to the ore reserves down to the 1,900-ft. level have reduced the average value of the ore by about 1¼ dwt., yet the gross money-value is increased and is over £2,000,000 sterling, that of the past year being about £1,800,000; and this estimate is a conservative one, and deals only with ore blocked out on three sides down to the 1,900-ft. level. Referring to the filters, the chairman considered they reflected the greatest credit on the ingenuity of their engineer and assistant manager, Mr. Ridgway. The costs were not yet available; but it seems certain that the cost of filtering by means of the Ridgway filter will be less than half that by the ordinary filter-press, and, on a basis of 500 tons per day, a saving of £4,000 or £5,000 per year may be expected. With regard to the outlook for mining in Western Australia, Mr. Doolette remarked incidentally that during his recent visit there he had traveled over 5,000 miles in going to the chief mining centres. He had seen the principal mines from Ravenshorpe in the extreme south to Black Range and Nannine in the north and northwest, and the strong impression left on his mind was that there are scores of veins throughout these various districts that fully warrant active prospecting and development.

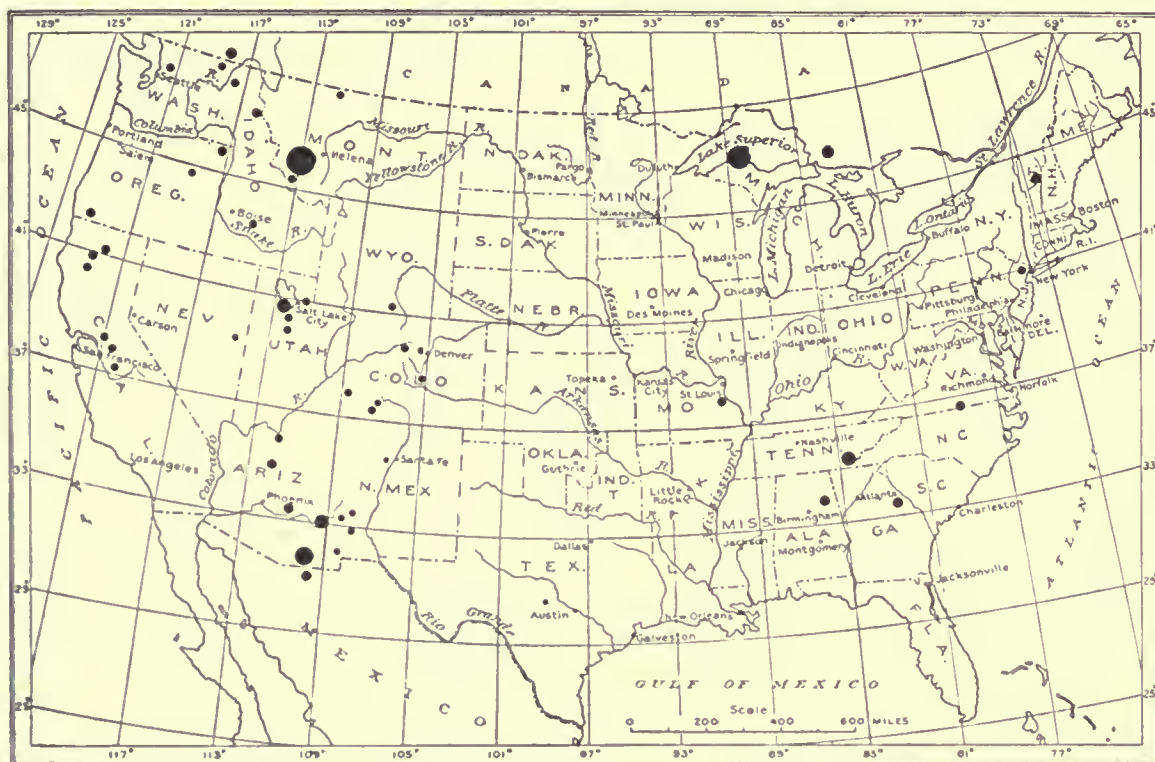
With the payment of the interim dividend of a shilling per share recently declared by the directors of the Camp Bird, the whole of the issued capital of £820,000 will have been returned. This is not a bad record for a company which, although registered on September 8, 1900, did not enter into possession of the property until May 12, 1902.

El Oro has just paid a dividend of 1s. 6d. per share. The directors have issued a circular giving information with regard to the important development which has

been carried out on the 1,000-ft. level during the past half year. The announcement of the June return at the mine is as follows: The No. 1. and No. 2 mills both ran 29 days, and together crushed 22,096 tons of ore, producing \$202,793; less working expenses (\$95,051), and the development expenses (\$12,508), \$107,559, or \$4.87 per ton; profit from the railway for the month, \$12,688; total, \$107,922. The sum of \$2,702 was expended during the month on permanent improvements.

Dolores results for June are not yet to hand, but it is rumored that the mine is again opening up well and that the net profit for the month will be little short of \$50,000, and would have been more but for breakages in the mill

business is shown by the results at Cananea, which have drawn, in addition to W. C. Greene, the attention of the largest copper interests in the world, until there are now operating in Cananea the Phelps-Dodge, or the Copper Queen people; Thos. F. Cole, and John D. Ryan and associates, or the Amalgamated Copper Co.; Thompson and Watson, with the Guggenheims in close sympathy; Chas. M. Schwab and associates of Pittsburgh; Pattison & Shattuch, which means also J. J. Hill; Hoffman, of Cincinnati; Loveland and Smith, of Duluth; and Lindsay and Talbot; all of which, taken collectively, and with affiliated interests, leaves few of the operators in copper not accounted for.



Map Showing Copper Regions of America.

(See also copper statistics on page 151.)

due to defective cam-shafts supplied by the Allis-Chalmers Company.

Mexico City.

Interest in Mexican Mining.—Copper Interests at Cananea.—Zinc Mining.—Monterrey and Chihuahua.—Development of Oil-fields.—General Activity.

If, notwithstanding the prosperity that seems everywhere in evidence in the United States, the cycle of years has run its course, and a panic is due in the United States, so that home capital, as well as French, German, and English has become wary of investment therein, no better field to which to turn could possibly be found than Mexico, where the finest opportunities are given, and from the amount of foreign capital which is being invested in the Republic, it would appear that a boom in Mexican enterprises is about due, if not already on. Many newspaper men are writing on Mexico, and even devoting entire editions to this country, as are also some of the semi-technical and financial publications, and, by this free advertising, the attention of investors is being rapidly drawn hither, especially when it is learned that there is scarcely a legitimate business that, if intelligently entered into, will not lead to a rapidly successful issue. And this is perhaps even more true of mining enterprises if preceded by anything like the proper kind of caution and investigation. What has been done in the copper

Likewise in zinc, the world's principal dealers are looking to Mexico for a large part of their supply, though as yet, unlike the case in copper, no zinc smelters have been erected in Mexico. The wonderful production during the last two years of zinc ores from the Villaldama, Sabinas Hidalgo, and Vallecillo, in the State of Nuevo Leon, together with the proximity of the Coahuila coal-field, led to considerable talk for some time regarding the building of a zinc smelter at Monterrey, but it has come to naught. The supply of zinc ores for the Monterrey market, however, is sufficient to keep alive the agencies for the Empire Zinc Co., the Edgar Zinc Co., the American Metals Co., the Cockerill Zinc Co., and the Minerals & Metals Co. (or the Peñoles Mining Co. of Mapimi, the Mexican end of the Metallgesellschaft of Frankfurt), whose competitive bids make a zinc mine almost more to be desired than a gold mine, and many men have already made themselves rich on zinc in Mexico (where its value even yet is not widely known). Operators with small capital have quietly got hold of zinc properties that were thought practically worthless because they had no lead, silver, or gold. But it is not alone in the Monterrey district that zinc is being eagerly sought. At Charcas, in the State of San Luis Potosi, the Tiro General (J. G. Creveling, Jr., president and general manager) is putting in a Sutton-Steele dry separator; and Arthur Pallandt has been shipping zinc ores for years from this camp to the European market. It is to the State of Chihuahua, how-

ever, one must turn for the largest zinc mines of the Republic. These are the El Potosi, of the company of that name, in the Santa Eulalia district, near the city of Chihuahua, and the Calera, of the Calera Mining Co., near Miñaca, the terminus of the Chihuahua & Pacific railroad. This latter mine is shipping about 100 tons per day of a lead-zinc sulphide, part to Canyon City, Colo., and part to L. Vogelstein & Co., New York. From the Potosi only about 30 tons per day, or 1,000 tons per month, of zinc carbonate is being shipped, which, however, could be greatly increased, as its zinc deposits alone are enough to make Santa Eulalia famous, but the company is giving most of its attention to its silver-lead ores, which are being shipped to the American Smelting & Refining Co.'s plant at El Paso. The zinc of the Monterrey district is mostly an oxide and that of Charcas a sulphide.

But it is not alone to copper and zinc that capital is turning in Mexico. A \$50,000,000 company has just been organized to exploit on a large scale the well-developed oilfields of San Luis Potosi and neighboring States. Several million-dollar companies are but lately formed to open up new lands covering the Coahuila coal-beds. The great success of the cyanide process in the treatment of the silver ores of Guanajuato has drawn additional capital there, and led to influx of new capital with the cyanide process in the old camps of Pachuca and Zacatecas. Wherever you may turn there is new work with excellent results, and new railroads building or contemplated are bringing distant mining districts into touch with the world.

Toronto, Canada.

Meeting of American Institute of Mining Engineers.—Papers by W. P. Blake, James Douglas, G. B. Lee, and W. L. Saunders.—Interesting Sessions.

The annual summer meeting of the American Institute of Mining Engineers was held at the King Edward hotel, Toronto, commencing on Tuesday, July 23. About 200 members were in attendance, accompanied by a number of ladies. At the opening session the chair was occupied by John Hays Hammond, the president. Alderman J. J. Graham, on behalf of the city of Toronto, extended a cordial welcome to the delegates; this was appropriately acknowledged by the president.

James Douglas, of New York, presented to Rossiter W. Raymond, the secretary, his portrait in oils as a recognition of a long term of service. In the course of his reply Dr. Raymond expressed his pleasure at the meeting of the Institute in Canada, saying that the word 'American' in the title of the Institute was not political, but continental in its significance. It was announced that an honorary membership had been conferred on Charles D. Walcott, until lately Director of the Geological Survey of the United States. W. P. Blake read a paper on the destruction of the salt industry at Salton, San Diego county, Cal., by floods due to the overflow of the Colorado river, causing losses amounting to hundreds of millions.

James Douglas presented a thoughtful paper entitled 'Some Reflections on Secrecy in the Arts,' being a strong plea for the interchange of opinion, and the free communication of experiences to facilitate the solution of technical problems. Many large manufacturing and mining concerns imposed no restrictions in this respect, though others did. If it depended upon technical workers these barriers would be broken down, as there was no diversity of opinion as to the need of open mindedness. Technical science could only progress through the co-operation of many workers. He cited Michael Far-

aday, Rontgen, and other scientists as examples in this respect, and contended that if secrecy were abandoned and every encouragement given for co-operation and mutual help, much more rapid advances would be made. Too much secrecy and suspicion had resulted in the decline of the copper smelting industry in England. Every limitation meant concealment of some fact or principle which needed to be made public in order to secure its full development. E. W. Parker, of Washington, read a paper on the condition of the coal briquetting industry of the United States.

In the evening a reception was held at the Parliament building, which was profusely decorated for the occasion. The visitors were received by Chief Justice Moss, acting Governor, and several ladies. The Minister of Lands and Mines presided. Chief Justice Moss and others made addresses of welcome which were fittingly responded to by Messrs. Hammond, Raymond, James Douglas, Hunt, and Blake.

On Wednesday R. W. Raymond read a communication received by James Douglas from G. B. Lee, superintendent for the Copper Queen Consolidated Co., at Douglas, Arizona, calling attention to a peculiar case of the corrosion of water-jackets of furnaces. A water-jacket, taken from a new furnace in use for five months, was found to have the inner sheet badly pitted, while the outer sheet did not appear to have been attacked. The rotary pumps circulating water for the condensers, made of cast iron, were also badly pitted at certain points, being eaten away one-quarter inch for a space of one or two inches close to spaces not attacked. No action at all was detected in the boilers, which, after being in use for 2½ years, were reported by the inspector as being in excellent condition. The water, obtained from wells 500 ft. deep, had been repeatedly analyzed without detecting anything that could explain the corrosion. The company is substituting a water-jacket of charcoal iron in the hope that this will not be attacked as badly as the steel. Samples comprising a staybolt and a piece of metal showing the ravages of corrosion were forwarded in the hope that some of the members could explain the cause.

William L. Saunders, of New York, presented a paper on 'The Electric Air Drill' which he stated was the only drill ever constructed for the drilling of rock by electric power that was commercially successful. Electricity is supreme as a means of conveying and directing power, and the problem of applying it effectively to rock-drilling had been before mining engineers for 20 years. Sixteen years ago Edison thought he had solved it but the solenoid drill had proved a failure because it had not the power of pull requisite. Altogether he estimated that some \$800,000 had been spent before success was attained by the adoption of the principle of air pulsation by electricity. This principle was applied to other machines and was utilized for the process of cutting grooves in marble in the Vermont marble quarries in place of condensed air. The consequence was that the quarries were now free from the fog produced by condensed air. The Ingersoll-Rand Co. had installed in mines about 100 electric air-drill plants, which were giving satisfaction. A distinctive difference between the electric-air and compressed-air drills was that in the former the cylinder was built without valves and the chuck was a steel casting of a more simple character, dispensing with bolts. The paper was illustrated with views showing the drill at work. The reading of this paper was followed by a general discussion. In answer to questions, Mr. Saunders explained that the drill gave a peculiar stroke, combining a pull and a push, the compressed air acting like a spring in forcing the drill back and rendering it easy to extract when caught in the rock. The cost of the drill

was about 20% higher than an air-drill equipment, but the saving in fuel amounted to at least 50 per cent.

Robert Bell, of Ottawa, read a paper on the 'Tar Sands of the Athabaska District.' He stated that he did not know of any district in the world where there was so great an accumulation of tar sand due to the outpour of petroleum, as existed in the Athabaska valley. The tar sand covered an area of 1,350 square miles at an average depth of 150 ft. There would be about 11,000,000 tons of tar substance apart from the sand, and it was a valuable deposit, which might be utilized for the manufacture of oil or for fuel, paving, and roofing purposes. Eugene Coste corroborated the statements of the paper as to the extent of the area impregnated with tar. It was impossible, he held, that it had come from fossils, but it was due to volcanic emanations of which there was evidence in every oilfield. Geologists had never considered how much the gaseous emanations from the centre of the earth had affected the geological formations. Prof. Bell held that petroleum had a vegetable origin.

At the afternoon session the leading feature was a paper by Willet G. Miller, Provincial Geologist of Ontario, on the Cobalt mineral area with limelight views. Cobalt, he said, was unique in its association of ores. In no other part of America did the metals of silver, cobalt, nickel, and arsenic occur together. The only known places where they were found in combination were Saxony, Bohemia, and one place in France. Most of the noted mineral deposits of Ontario were unique. The nickel ores of Sudbury required years of experimenting for their profitable treatment. The corundum and mica deposits were also phenomenal. The Cobalt mines had been rapidly developed because the ore was so rich in silver, but owing to its peculiar and refractory character the cobalt, nickel, and arsenic had been practically wasted. The speaker accounted for the peculiar character of Ontario minerals on the ground that the rocks of Ontario were of an older formation than those existing east and west. The silver-yielding veins of the Cobalt area were mostly in the Huronian formation, some in the Keewatin, and some in the later diabase, but on coming to the Keewatin the silver in a vein sometimes stopped, while the cobalt and nickel continued. A reproduction of an old map of the country, dating back to 1744, was shown with the name, Baie de la Mine, indicating a locality on the east side of Lake Temiskaming. This had reference to the galena deposit known at that time, but had the French discovered the riches of Cobalt the destiny of the country might have been changed. The rich silver-yielding area of Cobalt was comprised within six or seven square miles. The newer discoveries on the Montreal river had not yet been worked out in detail, and it was not known how far conclusions drawn from the formation of the Cobalt area were applicable to them.

Alfred E. Barlow, of Ottawa, gave a paper on the Sudbury nickel area, illustrating the peculiar position of the orebodies which are all situated at the border of a laccolithic mass as the result of magmatic differentiation, though no doubt also influenced by secondary action. These deposits were characterized by marked uniformity, one orebody being much like another. The Creighton mine had reached a depth of 300 ft. At present only two of the mines were in operation, the Victoria by the Mond Nickel Co., and the Creighton by the Canadian Copper Co. In all, ore valued at about \$50,000,000 had been taken out.

This concluded the meeting, a large number of the members leaving the same evening on a special excursion under the auspices of the Provincial Government to Cobalt and other mining regions of northern Ontario.

New York.

Operations of the Guggenheims.—Several Recent Disappointments.—Morgan's Co-operation.—New Coalfield.—Consolidation of Ely Copper Mines.—Probable Opposition.

The Guggenheims have been the subject of many rumors lately, and all of them suggest financial embarrassment. In California, the Dairy Farm mine (in Placer county), which cost \$600,000, has proved a disappointment, and the Balaklala deal (in Shasta county) has ended in a fizzle. Until lately the Guggenheims held 80,000 shares out of the 525,000 issued, the control being with McCornick and Brevoort. It was arranged that the Balaklala matte should be sent to the A. S. & R. smelter, and that, in return, the Guggenheims should furnish money to build the smelter at Coram. But this they failed to do, the contract was broken, and a new one is under discussion. On the top of this comes the abandonment of the scheme to build a large copper smelter at San Bruno, near San Francisco. No wonder that the gossips have been busy. It is stated that 200,000 shares of the A. S. & R. stock were sold at \$80 at a time when the market stood at \$108, and that this forced sale was made to the Standard Oil people, in fact, a well informed engineer, borrowing the simile of the roulette table, said that "when the wheel stops, it will point to Amalgamated Copper," meaning that a counting of shareholdings in the smelter trust will indicate that the Guggenheims have lost control to the people identified with the Amalgamated Copper Co., that is, H. H. Rogers, Rockefeller, and the Standard Oil group.

There has been talk of Mr. J. P. Morgan becoming associated with Mr. Daniel Guggenheim and his brothers, and the nature of the explanation for this event in *haute finance* has varied from a statement that it meant a great consolidation of heavy capitalists to the inference that Guggenheim was associated with Morgan in the sense that Jonah was associated for a time with the whale. As a matter of fact it is known that the Guggenheims have long wished to obtain the support of Morgan and it was regretted by Mr. Daniel Guggenheim that his mining and smelting companies were not underwritten by that famous art collector. As to the sale of 100,000 shares of A. S. & R. stock to Morgan in order to extricate two Guggenheims who had speculated neither wisely nor well, that story may be founded on the fact that some of the Guggenheim employees have been unfortunate on Wall Street lately.

The transfer of a ten million dollar interest in the smelter trust is likely to be a part of a Morgan participation with Guggenheim in Alaska. It will be remembered that the Morgan and Guggenheim interests have worked together over the Copper river railroad and copper mines. In their railroad scheme they have fought the White Pass people in a contest over right of way. More important even than the copper mines is the coalfield at the foot of Mt. St. Elias, to exploit which a strong consolidation has been formed this week. A semi-anthracitic coal has been found in quantity sufficient to make it a factor in the development of the Pacific Coast; any mineral development that will break the high prices now paid in San Francisco is likely to be welcomed.

The *Boston News Bureau* states that daily conferences have been held looking to the taking over of the Nevada Consolidated and Cumberland & Ely properties into the Consolidated Copper Co., recently organized by the Guggenheims, and it is stated that the basis of the deal is to be 2½ shares of Copper Consolidated for 1 Cumberland & Ely, and 3 shares of Copper Con. for 1 of Nevada Consolidated. This is unlikely, for according to reliable

information the best Cumberland & Ely can do is to show 1,000,000 tons of ore as against 20,000,000 in the Nevada Consolidated. It is true the former claims a better grade of ore, but it is too poor in iron for direct smelting and too high for economical concentration, permitting only of concentration in the ratio of $2\frac{1}{2}$ or 3 into 1, as against about 7 into 1 with the Nevada Consolidated ore. The *News Bureau* forgets that there is a large holding of Nevada Consolidated in San Francisco and it is stated that the shareholders in question are prepared to present an effective opposition to any further juggling with their interests.

Cripple Creek, Colorado.

Activity Among Lessees.—The Portland Tax Suits.—Deep Mining.—Strike in the Henry Adney.—The Findley.

Shipments from Bull hill show the activity of a number of lessees. From the Brooklyn, of the Stratton estate, H. P. Reiton has shipped a carload to the Golden Cycle mill at Colorado City, expecting returns of \$25 per ton. Mance & Co. were shippers from the Wild Horse to the Golden Cycle mill, while some half dozen other lessees contributed carload lots of an average grade to the general output: O. A. Carper from the Pinto-Bison, a \$30 consignment, the Union Leasing Co. and the Standard M. & D. Co. substantially aiding the output.—The Isabella is breaking ore four feet wide on the 900 and 1,000-ft. levels, neither hanging or foot-wall is as yet exposed. The opening of this orebody is a great addition, from all accounts, to the present value of the property. Drifts on the orebody continue to prove its extent, the slope being opened for a hundred feet, on company account. Lessees are also operating in ore of good grade under the management of John Sharpe for the Colorado State investment Co. Seventy-five feet of drift has been done and stoping is now in progress, while regular shipments are being made. The Isabella mill is in operation, about 100 tons per day being put through; ore running \$4 per ton is taken from the dump and low-grade portions of the mine.

The Portland company is under the fire of an Iowa court in the matter of taxation, \$100,000 of taxes being in question, and the County Treasurer, of the county in which Council Bluffs is situated, and where, until recently, the annual meetings were held, has nearly a thousand suits pending against individual stockholders. The present litigation will no doubt decide the issue in all the cases. Originally the Portland was incorporated under the laws of Iowa, to be later re-incorporated in Wyoming. The Portland is conducting development work at a depth greater than that undertaken by any other property in the district. On the 1,200-ft. level winzes have been sunk to prove an orebody that has given returns of an ounce to three ounces per ton. No. 2 shaft is to be sunk 150 ft. below the 1,200-ft. level and a station cut and laterals run; this to be known as the 1,350-ft. level, though the actual depth is over 1,500 ft. below the surface. Operations at this depth will be watched with interest.

The Henry Adney, the steady producer of Beacon hill, comes forward with a reported strike of exceptional merit. Drifts are in progress on a 15-ft. vein between the 400 and 500-ft. levels and a seam $4\frac{1}{2}$ in. wide was encountered assaying as high as \$28,000 per ton, with grab samples from the muck pile of \$2,450. Ore is being broken between the 500 and 600 levels 3 ft. wide, giving returns of two ounces per ton.—The Findley requires more room for dumping ground and has ordered persons owning dwellings on its property to remove same at once; when this is done cribbing will be put in place on the vacated ground, thus increasing the dumping area.

Butte, Montana.

Butte Continental.—British Butte.—Butte & Bacorn.—Shortage of Coal.—Heinze and His Partner.—The New Departure.

George L. Spangler, of Duluth, representing Minnesota capitalists, has been examining the property of the Butte Continental Co., in which he is interested. There is one big vein on the property, and it is believed that shipping ore will be found at a depth of 500 ft. Arrangements are being made to sink a two-compartment shaft. The company owns 10 claims. The present capitalization is 1,000,000 shares at \$1 per share.—Charles Olden, who came from London to make an examination of the placer property of the British Butte Mining Co., has gone back to England to recommend the installation of a dredging plant. The property is situated about four miles west of Butte. The company has purchased the head-frame and other machinery used by the Butte Exploration Co. at the Six O'Clock mine. Two 80-hp. boilers have been installed, doubling the steam capacity, and cages have been put in the shaft.

The Butte & Bacorn Mining Co. has finished cutting a station at 1,000 ft. in the shaft on the Calumet, and has



Montana.

started cross-cutting north and south. The north cross-cut is to be run nearly 900 ft. to connect with the shaft on the Belinda, but it is expected that at least one vein will be cut within 100 ft. of the station. Everybody in Butte is watching with great interest the progress of the work, and the developments by the cross-cuts, for if the Butte & Bacorn finds ore in the veins in that portion of the Butte district, it will prove the extension of the productive territory. The Butte & Bacorn property is about two miles north of any other developed property. It has been freely predicted by mining men, however, that the Butte & Bacorn will find that 1,000 ft. is not sufficient depth for finding ore. Some exploration work was done on the 500-ft. level, and several well mineralized veins were opened, but they carried no commercial ore.

Walter L. Steele, of Dallas, owner of a system of dry concentration and separation, has made arrangements with the La France Copper Co. of Butte for the installation of one of his plants in Butte. Several of these plants are said to be in successful operation in Mexico and Arizona.—O. M. Best, manager of the New Departure mine, reports that the cross-cut from the 50-ft. station below the adit level has penetrated a vein of rich ore. The point of the strike is about 350 ft. below the surface; ore is being broken at several places in the mine.

The Butte Reduction Works is still short of fuel, and the manager complains that the railroads cannot supply sufficient coal. Only a small portion of the orders can be

filled, and the situation already presents a serious problem for the coming fall and winter. As it is impossible to get sufficient coal to supply the smelters at this season, it appears certain that the supply during the winter will not meet the demand.

The litigation in which F. Augustus Heinze has become involved through a disagreement between himself and his former banker and business associate, Thomas M. Hodgins, has resulted in an attachment of Heinze's interests in the Silver Bow National bank and the State Savings bank of Butte. He owns controlling interests in the two institutions and is supposed to have money on deposit in both banks. According to the claims of Hodgins he entered into a partnership with Heinze early in last year for the purpose of investing and speculating in mining stocks. He says Heinze purchased for their joint account a lot of Amalgamated and Anaconda stock. He sold some of it and realized good profits, but other shares he held too long and lost money. Hodgins says Heinze has never accounted for his part of the partnership business. He also says that under the same agreement he purchased during three days in February, 1906, 3,350 shares of Bingham Consolidated stock for himself and Heinze, paying on the open market a total of \$133,980 for the stock, paying \$38 to \$40 per share for it. He offered half of it to Heinze, under their alleged partnership contract, but Heinze repudiated the agreement and refused to put up his half of the cost of the purchase. Later came the rupture between the two men and suits were brought by each against the other. In the Bingham deal Hodgins sued for \$66,980 and attached the Heinze interests in the two Butte banks owned by Heinze. In the Amalgamated and Anaconda deals he has sued for an accounting. Heinze has also sued Hodgins for a large sum of money which he is alleged to have misapplied while cashier of the State Savings bank, and his litigation with his former business partner promises to become as noted as the litigation he once had with the Amalgamated.

Denver, Colorado.

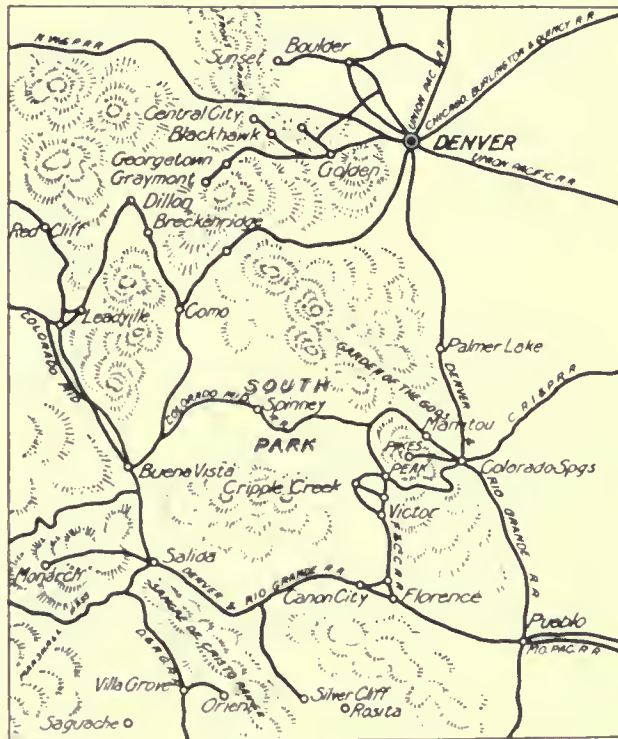
Bulletin on Leadville.—News From Ward.—Activity at Telluride.—Freight-Rates on Cripple Creek Ore.—Elkton Dividend.

The bulletin of the United States Geological Survey on the geology and mineral resources of the Downtown district at Leadville has at last appeared and is now ready for distribution. The bulletin is issued preliminary to the publication of the revision of the monograph on Leadville, which will not be ready for some little time yet, partly to satisfy the demands for a speedy publication of the results of the examination of the Downtown district, and partly in order that any errors that may possibly be discovered in the preliminary work may be rectified. The bulletin should prove of signal service to all those engaged in exploiting deposits in this part of the area. It can be secured upon request to the Director of the United States Geological Survey. Ask for Bulletin No. 320.

The Modoc mill at Ward is being remodeled to adapt it to cyanidation, as the preliminary experiments have gone to show that a high extraction can be made without roasting. Since the company has large reserves of ore blocked out the prospects of success seem exceedingly bright. The mill has experienced much trouble in the past from inability to secure sufficient fuel in the winter. By developing a water power on St. Drain creek 2,000 hp. of electric energy has been made available to solve this difficulty.

The Bear Creek district, near Ouray, which has had a long history of rather indifferent success, is showing

much activity at present. The Blackbird is shipping ore and the Grizzly Bear is also producing some ore of good grade. The Union mill is now in process of construction, and will be ready to start soon. At Telluride, the Columbia-Winona mine and mill have been sold to the Iowa Mining Co., together with the Pay Rock, Champion, and Chieftain groups of claims. John B. Farish is the consulting engineer for the company and it is expected that vigorous development will begin shortly. The Columbine group of claims is also being developed by a Kansas City company. Mining near Rico is active. Hahn's Peak likewise is the centre of a good deal of interest. The dredge recently put in operation by Hutchinson & Stevens is operating satisfactorily on the placer deposits. Another company has been



A Part of Colorado.

organized to operate in the district and has begun exploratory work.

At Cripple Creek, it is announced that the Jo Dandy mill has begun operations, and is prepared to treat ores either by the cyanide or 'tubular' processes. Whether the latter involves grinding in a tube-mill or sucking through a straw is not so clear as would be desirable to the enquiring metallurgist.—The disagreement between the mine and mill owners, arising from the recent readjustment of freight-rates, is the subject of a conference between the two opposing interests. While pleased with the reduction of the rates on low-grade ores, the former are not so well pleased with the increased charges on the high-grade ores. Another grievance of the millmen is that the charge to the Colorado City plants is made the same as to the Denver and Pueblo smelters, a discrimination that works to their hardship.—The cave-in at the No. 2 shaft of Stratton's Independence last week did very little damage except to the tracks of the Colorado Midland railroad. The shaft is now practically abandoned, and the cave, which extended to the 300-ft. level, simply filled the old stopes and levels.—At the annual meeting of the Elkton Mining Co., all the old officers and directors were re-elected. The total production for the year was \$682,500, and the net profit \$317,000, or a profit of 51% on the gross value of the ore, which shows an economical management. The Elkton stands second of the Cripple Creek mines in the payment of dividends.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

TO TEST the quality of boiler iron, bend it, cold, at sharp angles and double the pieces together; heat the piece to a cherry red and perform the same operation; punch holes very near the edges of the sheets, and if it stands these tests without cracking, it is neutral iron and considered to be of the best quality.

IN the Tertiary rocks of California gypsum is widely distributed. It is found throughout nearly all the coast ranges, particularly south of San Francisco bay, in the foothills of the Great valley, and in the valleys of southern California. Deposits are known to occur in the counties of Fresno, Ventura, Kings, Monterey, Kern, San Luis Obispo, Santa Barbara, Los Angeles, San Bernardino, Riverside, and Orange.

HESSITE is a silver telluride, in which gold is often present replacing part of the silver; in this way it graduates toward petzite. It crystallizes in the isometric system, but the crystals are often highly modified and distorted. The cleavage is indistinct, the lustre metallic, and the color between lead and steel-gray. Typical specimens have been identified in this country from Calaveras county, California, Boulder county, Colorado, and Dry Canyon, Utah.

IN the White Cliffs opal district of New South Wales there occur many pseudomorphous forms of opal after shells, crinoids, saurian bones, and coniferous wood, and there are also curious masses of grouped crystals, known locally as 'fossil pineapples,' representing the replacement of some mineral not clearly determined. A paper has appeared in regard to these problematic bodies in which we are led to believe that the original mineral must have been glauberite.

GYPSUM can be obtained in quantity at several localities in southern Arizona, the following being particularly noteworthy: In the Santa Rita Mtn., Pima county, southeast of Tucson; in the low hills along the course of San Pedro river, Cochise and Pinal counties; in the Sierrita Mtn., Pima county, south of Tucson; in the foothills of the Santa Catalina Mtn., Pima county, north of Tucson; on the Fort Apache reservation, Navajo county. Of these districts only the fourth, north of Tucson, has as yet been commercially developed.

CONSIDERABLE quantities of the mineral cryolite are imported from Greenland each year for use in the manufacture of sodium salts. In the processes of manufacture calcium fluoride results as a by-product, and is saved to be sold for use as a flux in open-hearth steel furnaces in the same manner and with the same results as the natural calcium fluoride, or fluorspar. The quantity of the artificial fluoride made depends, of course, upon the quantities of cryolite treated, and is said to be usually from 3,000 to 4,000 short tons per year.

COMPRESSED-AIR LOCOMOTIVES work under pressure ranging from 500 to 2,000 lb. per sq. in. The pressure is determined mainly by the size of the locomotive permitted by the dimensions of the tunnels and curves. In tunnels of good size the large reservoirs required by low-pressure engines are permissible, but where only small reservoirs can be used it is necessary in order to carry the supply of power required to compress the air to a

higher degree in the steel tubes, which are made of such a strength as to safely carry the pressure.

SALT occurs in vast quantities in the deposits found in the ancient lake basins of the southern part of California, but the only commercially productive deposits of this character have been flooded by the recent diversion of the Colorado river into the Salton sink and thus removed from consideration. The great production which puts California into the sixth place in order of output among the States comes from the evaporation of sea water, the conditions for which are particularly favorable on the east side of San Francisco bay in Alameda county.

HARDENING AND TEMPERING steel is effected by heating it to a cherry red and plunging it into a liquid, generally cold water. The degree of hardness depends on the heat and rapidity of cooling. Steel in its hardest state being too brittle for most purposes, the requisite strength and elasticity are obtained by tempering, which is performed by heating the hardened steel to a certain degree and cooling it quickly. The requisite heat is usually ascertained by the color which the surface of the steel assumes. A straw color is commonly used for cold chisels and machinists' tools.

LATE developments in the application of rotary furnaces, similar to those employed in the manufacture of cement, to the treatment of fine iron ores, principally pyrite, clinker, blue billy, and flue-dust from blast-furnaces, are to desulphurize them and to form the fine material into nodules of such form and texture as will permit of transportation to blast-furnaces, and of delivery of this material to the smelting zones. This process makes available ore which, either because of its sulphur contents or its fine state of comminution, was considered undesirable, and also reduces the loss of ore due to modern methods of charging blast-furnaces and of operating them with high blast-pressure.

THE flicker photometer, when introduced, seemed to offer advantages enjoyed by no other instrument. It depended for its action upon a peculiar effect to which the eye is more or less sensitive, and did away with the necessity for comparing two surfaces. In other words, surfaces illuminated by the two sources being compared are brought alternately into the field of vision. When illumination on the two surfaces is equal, no variation is seen, and the flicker disappears. There has been some question, however, whether this instrument is a true photometer—that is to say, whether the effect produced in the eye by the flickering surface is proportional to the illumination of the surface, or whether other effects may not creep in, and thus vitiate the measurement.

THE diamond deposits of Brazil have been worked since the early part of the 18th century, and have yielded well, although at the present time the yield is rather small. The most important region was that near Diamantina, in the province of Minas Geraes. It is situated along the crest and on the flanks of the ridge that separates the Sao Francisco river and its branches from the Jequitinhonha and Doce rivers. The diamonds are obtained in part from river washings and in part from prairie washings, as on the high ridge known as the heights of Curralinho. The river deposits consist of rolled quartz pebbles, mixed with or cemented by a ferruginous clay that usually rests on a bed of clay. The diamonds are most plentiful in large pot-holes in the bed-rock. In the upper plateau diggings the diamonds occur in part in a conglomerate, and some are reported from a quartzose schist in a region farther to the north.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

A Fundamental Problem.

The Editor:

Sir—In your issue of June 29 under the caption of 'A Fundamental Problem' you discuss a subject which is truly at the bottom of all the principles upon which the mining industry is based. The advice you gave to the broker is thoroughly judicious. One line in it suggests to me some thoughts, which I offer herewith.

The line was, "Get good technical advice. If you can't pay for it stay out of the game." Previously in your article you had raised the question, "Is mining only a gamble after all?" Now, what is a gamble and what is mining? According to the Century dictionary a 'gamble' is a "speculation, dependent for success chiefly upon chance, or unknown contingencies." A comprehensive definition of 'mining' would be: First, extracting from the earth mineral of which the amount and value have previously been determined; second, the searching in the earth for the mineral that it is hoped will be found there.

Now, in the first division of this definition there is probably a smaller percentage of chance than attends any other mechanical operation. Everything is subject more or less to chance and the unexpected sometimes happens, in spite of the most accurate calculations; for instance, the recent wreck near Santa Barbara on a straight track in broad daylight, the tidal wave at Galveston, the conflagration at San Francisco, the fire in the Homestake mine. But such catastrophies do not render business undertakings 'gamble.'

In the second division of the definition there is gambling if the results are "dependent chiefly upon unknown contingencies." The lower levels of the Gwyn mine had been flooded and inaccessible for years. A mining engineer who had not been underground in the mine at any time in its career sunk a new shaft, and while sinking built an elaborate mill. At a depth of 1,400 ft. in the shaft ore was struck, the stamps began dropping, have continued to drop ever since, and dividends have followed each other with gratifying frequency.

Two soldiers of fortune secured a lease on a mining claim with no record and sunk a shaft. After a time the Mohawk was producing gold faster than it ever came out of a new mine before in mining history.

Both of these cases come under the second division of the definition. The first was not gambling; the second was. Why? Because in the first place a mining engineer of proved experience had informed himself from the record of the Gwyn what had been the nature of the vein while it was being worked and approximately what had been extracted; hence by deduction he inferred what was likely to come out.

The second was gambling, because the physical conditions were not such as to enable a mining engineer to predict with assurance any deposit at all.

The Guggenheim Exploration Co. buys mines. When one is offered which presents sufficient evidences of value to insure consideration, the Guggenheims send one or more of the most competent mining engineers available to measure and compute the amount of ore disclosed, and estimate the cost of its extraction. It then has other engineers take the report of the first and calculate the cost of converting the ore into metal. By ordinary subtraction it finds the sum representing the net money, and with that information it negotiates for the mine, which,

if purchased, is operated under the first division of the definition of mining.

The broker knows what happened at the Mohawk and builds air castles. He calls in a mining engineer of the camp and asks the question, "If I secure a certain piece of ground (naming it) and work it, what are my chances?" The mining engineer looks at it and replies, "They are just as good as were those of the Mohawk at the start." The broker thereupon raises the money and—gambles, the very worst illustration possible of the second division of the definition. He strikes—nil. Who is to blame?

Now does this mean that no one but the Guggenheims and others in their class can mine without gambling? By no means. There are opportunities to purchase mining properties (at reasonable figures), which the experienced engineer is justified in believing will make pay mines. These will not, as a rule, be close to populous camps where everybody sees them. They may belong to prospectors in some remote field. They may have been once worked and abandoned and filled with water and waste. They may contain a valuable mineral unappreciated by the claimant. They may have such composition that new conditions (a concentrator, a railroad, some novel means of treatment, the development of water-power), are essential to giving any margin of profit. Their value may be potential only and the mining engineer is the man who alone can adequately discern it.

The most successful mining engineers and individual operators have secured their greatest successes by employing mining engineers and sending them out under general instructions to ferret out just such opportunities. There are chances involved, but these are fairly compensated by the law of average.

Let any one think over to himself the names of all the successful mining men and corporations familiar to him and also the names of all those who were once successful and failed; then let him figure the percentages of failures to successes. Then let him compare that percentage to the percentage in any other kind of business. That would be the test of whether mining is gambling and not the experience of the broker that wrote to you, however well meaning or honest he may have been.

JAMES W. ABBOTT.

Pioche, Nevada, July 13.

A Correction. Oaxaca.

The Editor:

Sir—I have read with interest the remarks in your number of June 29, under 'Mexico City,' on the Oaxaca Smelting Co. and the Magdalena smelter. I would, however, beg the hospitality of your columns for the purpose of making a few corrections in your correspondent's statements, which as they stand are somewhat misleading.

Firstly, the name of the company owning the properties on which is situated the Magdalena smelter is not Williams & Hamer, but L. R. Hamer & Company.

Secondly, though your correspondent stated quite correctly that an option was at one time held on these properties by the Oaxaca Smelting & Refining Co. for the sum of P550,000, on which P20,000 forfeit was paid, he omitted to add the rather important fact that said option merely covered a half-interest.

Thirdly, I beg to state that there never has been, nor is there the slightest likelihood that there will be, any arrangement between my company and the Oaxaca S. & R. Co. The completion and blowing in of the plant of the latter company are matters which in no way concern my company, nor were we in any manner, directly or indirectly, connected with their operations.

Fourthly, the freight and treatment charges in Oaxaca

are not held at P42 per ton, as we, operating the only steadily running smelter in the district, have treated custom ore as low as P22.50 per ton, and our highest charge has never gone above P30.

I may add that so far from proposing to make any combination with any local interests, we are about to erect another smelter of 80 tons daily capacity for the treatment of pyritic ores, of which we have enormous bodies. The machinery for this smelter is already on the ground, and erection will begin very shortly.

L. R. HAMER.

Oaxaca de Juarez, July 10.

An Abandoned Project.

The Editor:

Sir—Your editorial in the issue of July 6, regarding the cessation of work on the San Bruno plant of the Guggenheims, calls for comment.

While not doubting the accuracy of your information as to the failure of the Dairy Farm mine at 500 ft. depth, I do seriously doubt the statement that this was the cause of the stoppage of work on the smelting plant. Why not be straightforward about it and say that it has been costing the Guggenheims so much more for labor, material, and time, to build this plant, that when to these troubles the threat of anti-smoke agitation came up, they accepted any fair excuse to stop the work and parley with their neighbors.

I am in no way connected with the Guggenheim companies, but I do know that they are not the kind to throw away money by building at the highest prices for everything, when, by waiting at little loss to themselves, they can gain so much. The failure of any one mine in this or adjoining States would not stop such an enterprise as this, for its tonnage must be made up from the shipments from many mines and where one will fail many will open up to take its place. I know personally that there are many producers of ores such as the Dairy Farm mine contains, that can and would take its place. The 'smoke question' is no doubt a more serious one, and the recent action of misinformed and prejudiced juries and courts in other localities, is a great menace to the industry in general. When the plant of a great smelting industry is equipped with every means for the abatement of the smoke nuisance, the question of the greatest good to the greatest number of people should have weight.

If we cannot build smelters in the hills because we may destroy a few scrub pine trees, and we cannot build them at tide-water on account of the golf links and dairy ranches, where are we finally to land?

There are mechanical means at hand and known to those skilled in the art, to so settle and filter and dilute the gases which finally pass from the chimneys, that damage to the neighborhood is reduced to a minimum. Not all plants now under fire of the agitation are thus equipped, of course, but surely the art of smelting must not stand still on account of the past sins committed in its name.

Such a plant as that at San Bruno would be of immense benefit to the State, and the few who might be harmed by its fumes ought not to be allowed to hold up such an enterprise.

JAS. W. NEILL.

San Francisco, July 14.

[Our friend Mr. Neill is reasonable in his criticism. Of course, we do not know what is going on in the minds of the Guggenheims, for to ascertain that might need some deep soundings, and the Dairy Farm mine may have been saddled with too much responsibility for the abandonment of smelting at San Bruno. It is likely that the

activity of the smelting companies in Shasta county was also a factor. We are inclined to belittle the smelter smoke agitation started by the people of San Mateo, because, as Mr. Neill says, it is possible to minimize the trouble from fume if only enough care is taken, and no coterie of farmers or polo-players can stop an industry so basic as that of smelting.—Editor.]

Secondary Ores of Copper.

The Editor:

Sir—In your Butte letter of February 23 reference is made to a recent development in the mines of the Anaconda Company, as having cut the Anaconda vein in the Neversweat mine at 2,400 ft. deep. The orebody is stated to be "60 ft. wide, with 40 ft. nearly all copper glance, running 60% copper."

In a former letter from the same source reference was made to a discovery in another Butte mine—the Anaconda, if I remember correctly—where ore up to 90% copper was found. This statement was manifestly incorrect and rendered unreliable the remainder of the letter, which otherwise was most interesting.

What one wishes to ascertain is whether this last statement as to 40 ft. of 60% copper ore is an actual fact or another random shot—this time within the bounds of possibility, since chalcocite can contain 78.8% copper.

In a letter of mine of November last to the *Mining Journal* of London I drew attention to the copper of the world being produced mainly from the enriched sulphides (chalcocite principally), and not, as formerly presumed, from the lean sulphide, chalcopyrite. I am pleased therefore, to note in your issue of March 30 an article from no less an authority than James F. Kemp, in which he states, "Today, on the contrary, in the United States and Mexico chalcocite furnishes much the largest part of the copper produced." Another interesting feature pointed out in this article is the possibility of chalcocite being regarded not as a secondary mineral necessarily but of original deposition. For some time bornite has been questioned as essentially a mineral of secondary deposition. If, however, both bornite and chalcocite are invariably secondary minerals, it is pointed out that such deposition may just as well be caused by uprising solutions of copper, as suggested by W. H. Weed, and not necessarily by solutions of oxidized copper salts in descending surface waters.

There would appear to be some interesting developments as to the origin of the enriched sulphides in the near future and the probability of encountering such sulphides as far as mining operations are practicable.

H. E. WEST.

Spassky, Siberia.

[Mr. West, being in Siberia, had not received our issue of June 15, in which it was explained that the rich ore from the Receiver mine, at Batte, consisted of native copper in gouge. It was not the Anaconda mine that was mentioned, but the Receiver, on the eastern side of the Silver Bow valley. Further discussion concerning the genesis of chalcocite ore appears in our issue of July 14, where Mr. Horace V. Winchell makes some suggestive observations, based on an intimate knowledge of the subject. Meanwhile, if the mining people in Siberia have read James F. Kemp, they are not without illumination.—Editor.]

STEEL is a compound of iron and carbon in which the proportion of the latter is 5 to 1%, and even less in some kinds. Steel may be distinguished from iron by its fine grain and its susceptibility of hardening by immersing it when hot in cold water.

Geology of Jamaica, as Related to Its History.

Written for the MINING AND SCIENTIFIC PRESS
By ROSSITER W. RAYMOND.

Sundry authors, among whom the late Prof. N. S. Shaler was one of the most eminent, have traced and emphasized, with respect to particular regions, the effect of geological characters upon human history; but I do not recall any published discussion of this interesting theme with special reference to the island of Jamaica, which furnishes, perhaps, one of its most striking illustrations.

It is not my purpose to offer in this article a complete scientific statement of the geological history of Jamaica. That work has been thoroughly and brilliantly done by a distinguished American geologist, Robert T. Hill, whose researches in the West Indies have been published in a series of monographs by the Museum of Comparative Zoology of Harvard University. I can only regret that the edition of these valuable papers is so small that neither my private library nor that of the American Institute of Mining Engineers contains them, or has thus far been able to secure them. In my study of Jamaican geology, I have been indebted to Mr. Hill himself for the loan of his own private copy, which I have read more than once with much interest and profit, and which constitutes not only the latest, but also unquestionably the most illuminating authority concerning a problem complicated with many perplexing details, heretofore misinterpreted. These details, however, do not concern my present purpose, for which it is sufficient to set forth the following leading features:

1. The island of Jamaica is the result of two successive uplifts, neither of which is older than the Mesozoic, together with intervening and following changes of level, permitting the deposition, elevation, etc., of sedimentary strata.

2. It stands in the centre of what Mr. Hill calls "the American Mediterranean," encircled by islands which seem to constitute a structural border for that inclosed sea; and it is characterized, as to a part of its shore, by the exceptional depth of the adjacent ocean, indicating, of course, the exceptional steepness of the primary uplifts, making the island, as it were, a precipitous mountain in the sea. This depth of intervening water has prevented, in many cases, the migration to Jamaica of superficial marine species, thus rendering more difficult the correlation of the coastal rocks with those of other islands; but that question does not concern me at present.

3. The causes already mentioned, together with the effects of torrential tropic rains, have impressed upon Jamaica the following geological and topographical features:

a. A central backbone of slates, etc., rising in places to 7,500 ft. or more above sea-level, and deeply and sharply eroded with precipitous canyons, so as to justify the famous illustration of Columbus, who, in describing the country to Queen Isabella, is said to have crumpled a handkerchief and thrown it upon the table before her, as a model of the irregular topography.

b. A plateau, chiefly of limestone, once deposited at sea-level upon the flanks of the aforesaid ridge, but now lifted to a considerable elevation. This plateau, encircling the older nucleus, and much wider in some parts of the island than in others, is characterized by peculiar so-called 'cock-pits,' or funnel-shaped depressions in the limestone, apparently produced by erosion, coupled with the downward drainage of surface-waters through the permeable rock to the harder and steeper strata below. Since, so far as I can learn, the 'cock-pits' are never found filled with water, this inference is irresistible.

c. A zone of cliffs and débris, produced by the breaking down of the plateau.

d. A zone of coral-rock, alluvium, etc., along the shore, sometimes forming extensive coastal plains, but often (especially on the northern and eastern sides of the island) relatively narrow and unimportant, in comparison with the predominant underlying central ridge, which impresses upon the coast-line, in the form of numerous navigable bays, its deeply-marked topography.

4. The geological conditions thus enumerated have been aided by the variety and fertility of the soil furnished by the different rocks, the variety of climate, due to the wide range of elevation furnished by the topography, and the difference in annual rainfall between different parts of the island, caused by the high intervening mountain range.

Having thus outlined those general natural features of Jamaica which are specially concerned in my present thesis, I proceed to indicate briefly their effect upon the history of the island.

1. Unlike almost all of the other regions, insular or continental, which were discovered and exploited by the Spanish, Jamaica seems never to have offered to them the temptation of gold. Indeed, so far as I can discover, nobody, down to the present day, has ever found suggestions, or even dreamed dreams, of gold on this island. As for other metals, there are rumors of copper deposits, and there is a lovely stream, called the River of Copper; but, whatever may lie in the unknown future, it is safe to say that the history of Jamaica has not been perceptibly influenced by that mining enterprise which has been the pioneer of industry and civilization in so many other regions of the New World.

2. But what the geology of Jamaica did not offer in this respect as a stimulus to adventure, it offered in another way as a facility for commerce; for the numerous bays presented by its indented coast became the refuge of ships. For many years, it must be confessed, the sort of 'commerce' thus facilitated was that of the buccaneers. But the business of the buccaneers, after all, was commerce, though complicated with piracy; and if we drop, for a moment, its moral aspects, we must recognize that what these bold adventurers found in Jamaica was the opportunity to hide from their enemies, and to exchange their plunder for the means of riotous enjoyment—which was, no doubt, wicked commerce, but commerce, nevertheless. And after piracy had died out, the advantages of Jamaica as a commercial centre remained. Being founded on permanent natural advantages, they will, as I believe, long continue. Indeed, they will be greatly increased by the completion of the Panama canal.

3. The geology of Jamaica, which had already thus pre-determined its commercial relations, again influenced its history when, during Oliver Cromwell's administration, an English fleet, sent out for another purpose, captured Jamaica, so to speak, by mistake. During the preceding two generations the Spaniards, having deported as slaves all available Caribs, had replenished Jamaica, for the operation of their plantations, with slaves imported from Africa; and when they were obliged to yield the island to the victorious English, they emancipated these African slaves, exacting from them a vow that they would never surrender to those who had conquered their masters. This vow was kept for more than a hundred and fifty years, during which the 'maroons'* inhabiting the recesses of the unbroken tropical jungle of the interior, and aided by their knowledge of the 'cock-

*The word 'maroon' is probably an abbreviation of a Spanish word, meaning 'rubbish' or 'outcast.' The notion that the 'maroons' of Jamaica ever comprised original Caribs, is, I think, an unfounded fantasy. At present, they can scarcely be said to exist as a distinguishable class.

pits' of the limestone plateau, and the intricate ravines of the mountain ranges, defied pursuit. From time to time, they descended in highland raids upon the dwellers below, retreating with their booty to their inaccessible strongholds. Expedition after expedition sent against them was trapped and massacred. They were intensely proud of their savage freedom, and regarded with peculiar scorn and hatred the African slaves imported by the English planters.

At last, they were brought to a treaty of peace, and became, without loss of dignity, the 'allies' of the English. This relation involved for many years no positive action on their part. But in the negro rebellion of 1865 Gov. Eyre called upon his maroon allies, who came down with ferocious enthusiasm and wrought much havoc among the insurgents. No doubt they went further in cruelty and devastation than the Governor intended or approved. This brief but bloody episode was their last historic appearance. They retired into the jungle, where they gradually lost their separate character; and their descendants have melted into the general mass of black inhabitants.

4. Meanwhile, the industrial development of Jamaica had been proceeding, both before and after the English conquest, upon the cultivation of imported exotics. It is a striking fact, that of all the trees and plants which we regard as characteristic of the island, very few are indigenous. The luxurious wilderness seen by Columbus contained no sugar-cane, bamboo, orange, lime, lemon, citron, grape-fruit, coffee, kola, cinnamon, mango, log-wood, nutmeg, rice, or bread-fruit, not to mention many other plants and trees of less notoriety, which, like these, are known to have been introduced from other countries. Whether the cocoanut-palm was present cannot be positively decided. There is no allusion to it in contemporaneous records. On the other hand the giant cotton-tree and the pimento (allspice), prickly pear, guava, paw-paw, wild olive, lace-bark, mahogany, cedar, satin-wood, straw-palm, and, above all, the cassava, were to be seen abundantly by the first European visitors, as they may be seen today.

Of the animal fauna of that day, everything has become extinct except the coney, which is now exceedingly rare. Horses, cattle, sheep, goats, pigs, and poultry have been imported since.

It may, therefore, be fairly said that the natural advantages of Jamaica have been utilized by the artificial introduction of foreign plants, animals, and men. Under the last head, the list comprises the early Spaniards and Portuguese; the slaves brought by them from Africa (the ancestors of the maroons); the English; their African slaves, probably of tribes not related to those which supplied the first importation; and, finally, the East Indian coolies. These Hindus, with their keen Aryan faces, slender and graceful figures, small hands and feet, grave dignity and reticence, and faithful industry, constitute a picturesque and puzzling element of the present population. There are a little more than 10,000 of them. They work mainly upon plantations until their contracts expire, when many of them choose to remain as laborers, shop-keepers, silver-smiths, etc.

The disastrous effects of emancipation upon the Jamaican plantation-industries are well known. That similar prostration did not appear in our own Southern States at the close of the War of the Rebellion, as a result of the abolition of slavery, destroying the plantation system for the culture of cotton, was largely due to the immediate development of cotton-raising by negro owners and lessees of small tracts. The area of the cotton-belt was thus greatly increased; and the crop became larger than ever. But in Jamaica, the production of sugar and

coffee could not thus be continued augmented; and until the development of the fruit business there was nothing to occupy profitably the freedmen who would no longer submit to the conditions of plantation-labor.

This new business, which has become the basis of a new economical progress, owes its prosperity and effectiveness to the old geological features which have done so much to shape the history of Jamaica. More than sixty steamships of considerable size are constantly engaged in this trade; and they collect their cargoes by running into the numerous bays along the coast, so that the native cultivator of bananas, coconuts, etc., no matter on how small a scale, can bring his product to a market with little cost and labor.

Another element of importance is the abundance of excellent macadamized roads,* for which the coralline limestones of the coastal region furnish the best of 'road-metal.' Here, too, the basis of prosperous industry and good government is geological.

On the other hand, it must be confessed that the geographical and geological conditions of Jamaica expose it to occasional earthquakes, cyclones, and droughts of great severity. Of these scourges, the latter two are the worst. The hurricane of 1903 was far more widely and permanently injurious than the earthquake of 1906; and since that earthquake there has been, in many parts of the island, a prolonged drought, the effects of which have been most disastrous. But in spite of these serious reverses, I see no reason to doubt that the energy of man, availing itself of the bounty of nature, will bring about in Jamaica a permanent prosperity, surpassing all that has gone before.

SUBSTITUTES FOR TIN.—The rise in price has also caused a search for a substitute for tin in the manufactures. The diminution in the price of aluminum, the practically limitless supply of raw material, and the physical properties of the metal are facts which must at once appeal to the technical imagination, and point to this—the most abundant of the metallic elements—as a possible substitute for tin. At the same time it is not the only metal which has to be considered in this connection. The world's annual production of tin is about 91,000 tons (long), and the principal uses to which the metal is applied are as follows: The manufacture of tin plates holding from 2 to 3% tin; the manufacture of machine bronzes and brasses, which in all probability accounts for the greater proportion of the world's consumption; the manufacture of various white alloys, such as solder, type metal, pewter, britannia metal, and white-bearing metals; ornamental bronzes and gold and silver-plated white metals; tin crystals, tin oxide, and the like.

SMEALTER PLANT AT KINGSTON.—In granting a site and exemption from taxation for 10 years to a lead manufacturing company of New York, and a local zinc company, the citizens of Kingston recently voted in favor of that course. The zinc company will erect buildings to cost \$100,000, and the lead company's buildings will cost \$40,000. The lead company is an American concern. Each company will employ 50 men. The Canadian Government will start at once to dredge a channel to the wharves to be constructed at the smelter sites, east of the city. The main supply of zinc ore to feed the proposed zinc smelter will be mined in the county of Frontenac. Zinc blende has been found at this mine, the ore being shipped to a New Jersey smelter heretofore. Other veins have been discovered in the northern portion of the county.

* This island, 150 miles long and less than 50 miles in average width, contains 4,000 miles of roads equal to our best.

Present Status of the Gold Mining Industry.

Written for the MINING AND SCIENTIFIC PRESS
By J. H. CURLE.

I suppose that this year the Transvaal will produce \$126,000,000 of gold, nearly all of it coming from the Rand conglomerate. The yield of this ore is now, roughly, about \$8 per ton. Even this low-grade average is only reached by considerable sorting on the surface, and by eliminating big patches of poor ore underground. These poor patches have become more frequent with depth, and engineers no longer sit at their desks and figure out the valuations of Rand mines by rule of three. There is not much profit earned by this big industry. As against an average yield of \$8, working costs may be placed at \$6. The balance is not all profit, for it has still

How can Rand working costs be lowered? Until recently the management has been extravagant, and there was no combined effort for improvement. Now, boards of directors have taken fright, and there is a general determination to exact greater all-round efficiency. It is realized that a cent per ton saved means \$150,000 per year profit, and that no channel of expenditure is too insignificant to be neglected. The directors will not greatly succeed in this. They are zealously cutting down all expenses and salaries—except their own. Their work, in these days, is mere routine, for which they are paid altogether too much, and until they voluntarily cut their fees in half, they will be able to impress neither manager, staff, nor miners that they are in earnest. I have not space here to discuss the question of Rand costs in detail, but will just say that the greatest room for improve-



General View of the Mysore Mines, India.

to be debited with redemption of capital; and on some of the shorter lived mines this item of capital redemption, if entered on the books, would more than wipe out the profit.

Owing to poor results from so many of the newer and deeper mines, the British public will not put up any more capital for further development; it has become disillusioned as regards the Rand. Any further financing of the industry, for years to come, must be carried out by the dozen or so big firms that control the mines. These people, of course, cannot put up all the capital asked for—over 100 million dollars—but they can at least carry out what they have guaranteed in this direction, and they have guaranteed to take up shares for 20 million dollars. If, because the share-market has since fallen heavily, they refuse to make good on these guarantees, the further development of the Rand will be greatly checked; the present number of stamps—some 8,000—will not be increased; the whole of the goldfield will be portioned off relative to the stamps already erected, and the shafts already sunk; and the ore, instead of being worked out at full pressure in 30 years, will last, at the present rate of exhaustion, for an indefinite period.

ment lies in the mining and handling underground, and especially in the work of the white miners. The Katlirs, if taken in hand seriously, and taught a sense of responsibility, are capable of better work. The suggestion of E. P. Rathbone, that big Katlir settlements should be established near Johannesburg, should be acted upon; there is money in teaching them to become more efficient miners.

The Chinese miners, introduced three years ago, have now become efficient, and though costing more than Katlirs, are found to give better value; besides, the reason for introducing them was because of the permanent shortage of Katlirs. On the subject of Chinese labor I agree entirely with the Rand directors. The Liberal party in England—in spite of the fact that this question concerns only the Transvaal and its inhabitants—has made a party-question of Chinese labor, and is trying to abolish it. Half these people believe that the Chinese are working in a state of slavery; the others believe that they are ousting an equal number of whites from employment. None of them, of course, know the facts. I know that in employing Chinese we are giving them better pay and more comfort than they would otherwise get;

that we are not keeping white men out of the billets the Chinese are filling; and that we are enormously assisting this industry by turning to this source of cheap and effective labor. I often see, even in American and Australian papers, statements that the Chinese took the place of white men. This is not true. These men receive, all included, less than \$1 per day, and no white man in the Transvaal can live on that sum. "Well," say the critics, "raise the scale of pay, and put in whites instead." This, of course, is a weak argument. I have already shown that the Rand is a low-grade field, and that on its ore, averaging an \$8 yield, there is only a small profit. Introduce all-white labor, at ruling rates, and the small profit would at once vanish and the mines close down. With the finest handling in the world the average Rand mill cannot employ all-white labor and earn a profit. To ignorant commentators let me point out that working costs are relative to conditions. In Australia, conditions usually admit of low costs, and ore yielding \$8 can be worked by white men at a good profit. In the Transvaal, as we see, \$8 ore yields a small profit worked by white and black labor mixed. In Nevada, \$8 ore is of no account to anyone—white or black. *Tout savoir est pardonner*, said the wise Frenchman. Finally, although unsound in its financial aspects, the Rand industry is of first-rate importance. In spite of over-capitalization, of poor patches, of loss of confidence, this field will continue to make an enormous production for many years. The gold of the Rand, placed in circulation, will prevent congestion of the world's banking facilities; and anything tending to limit or lower the production will tend equally to injure and restrict the world's trade.

Rhodesia, as a gold mining country, has been a failure. There is no lack of gold there, but it is not sufficiently concentrated for commercial mining. It is now realized that the average Rhodesian mine cannot support a capital of even £50,000, still less a board of directors, consulting engineer, and departmental staff. A number of small syndicates, whose members, assisted by the natives, run the mines themselves, are now at work in Rhodesia, and are earning profits where the companies could not. These syndicates mostly run five or ten stamps. Among some hundreds of gold mines floated on the company basis in Rhodesia, one alone, the Globe & Phoenix, has returned the actual cost put into it. Even this mine, at 1,000 ft., is looking shaky. Of the newer mines, the Giant promises to do well, as perhaps does the Penhalonga; but the financial aspect of gold mining in Rhodesia is not attractive.

Until this year I never believed that any of the West African gold mines were serious ventures. They were floated six years ago, and after the usual initial boom, passed almost out of memory. But I am satisfied that several of these mines have now merged from the development stage with valuable orebodies. Furthermore, it is now fairly well demonstrated that the climate, though bad, is not impossible, and that, as the result of this, a better class of men than formerly can be got to go out to the mines. The goldfield has now also got a railway from the coast, and working costs on the bigger mines are gradually reaching a normal figure.

The chief goldfield of West Africa is the conglomerate bed of Wassau, carrying an ore similar to that of the Rand. Most of this bed, traced and bored for some 20 miles, is evidently too low-grade to work, but there are spots where the gold is concentrated in well defined shoots. The ore-shoot of the Taquah & Abosso mine is unusually rich. A 50-head mill is just starting there, and according to the assay-plan, this should run on \$20 ore for the whole mine as exposed to the fifth level. This will be one of the biggest mills anywhere at work on such rich ore.

The Abosso mine is also well developed, and will average about \$15; a small mill has been running there for some months, and one 10% dividend has been paid. The Abbontiakoon Black and Wassau mines also contain ore-shoots of fair value, and should eventually earn profits.

Among the quartz lodes scattered over several West African fields, there has been the usual number of disappointments. Lenticular bodies, capricious in occurrence and in gold content, characterize most of these mines. One only, as yet, seems to have the makings of a big mine. This is the Prestea Block A. It is a strong vein, averaging 7 ft. wide, proved for some 1,500 ft. in length, and for 600 ft. in depth. All this will average about \$14, and for a quartz ore the gold occurs evenly throughout. There are now 50 stamps at work, to be increased to 100 when the railway reaches the mine. This property ought to have a future.

The last goldfield in Africa to be considered is that of Upper Egypt and Sudan—but I am afraid I cannot take it seriously. There is a little mine I inspected in Sudan called Um Nebardi, which will produce some gold, but I do not suppose it will return the capital sunk in it. As for the rest, they have not yet produced anything worth while.

Turning to America, the interesting features in the gold mining industry are the discoveries in Nevada and the dredging possibilities of Alaska and the Yukon. I believe in Nevada. I think it is the most wonderful mining country in the world. On the other hand the over-capitalization of these mines is terrible. I inspected a lot of mines at Tonopah, Goldfield, and Bullfrog, and tried to figure out some of these as having reserves relative to the price they were selling at. I found nothing. The public will lose heavily over Nevada, but this State will have a wonderful mining future.

Although actual figures are hard to get, it seems now to be realized that under certain conditions gold dredging in the frozen gravel of Alaska and the Yukon is a paying venture. The Guggenheim Exploration Co. is spending something like \$8,000,000 on a combined hydraulic and dredging scheme on the Klondike and in the season of 1906 good results were obtained from a dredge already in commission. I have mislaid the figures of this dredge's work, but it seemed to me, after digesting them, that dredging on the Klondike, allowing for a season of 120 days per year, and adding a liberal amount for depreciation, should not cost over 20c. per cu. yd., while the yield may average double that. There is one thing to be remembered: In these regions one cannot dredge away from his base, that is to say, away from a machine-shop, and the equipment and running of machine-shops in the Arctic, unless close to a transportation route, is hardly to be thought of. I believe that in certain cases dredging in these countries will pay well, but before risking money I should want to be dead sure on a good many points.

In Canada, as is usual, the gold mining outlook is disappointing, excepting the Klondike. There is really no goldfield in the Dominion worth taking note of. The reported discoveries north of Cobalt have not been confirmed.

In Mexico, the El Oro field still gives great hope. In the El Oro mine a new make of ore seems to be coming in at the 1,000-ft. level. This is sulphide, in which values have hitherto not existed. The adjoining Esperanza has used up its shipping ore, but the main lode is reported as still looking well in the bottom. Next to this is the Mexico, reported as having more net profit in sight than the price at which the mine is selling on the market. The biggest gold mine in Mexico I believe to be the Dos Estrellas, lying a mile distant from the El Oro vein. If this were properly developed and equipped, it

ought to do wonders; but its present shareholders do not understand these things.

In Central and South America there is not much gold mining. Dredging, as yet, has not made real progress. The dredging areas in Tierra del Fuego are shown to be of doubtful value, and the results from dredges in Matto Grosso are too small to be taken seriously.

In Australia there has been a steady falling off in the gold yield for several years, and no new mines of any value have come forward. The Kalgoortie district in Western Australia is getting poorer in depth, but the ore exposed by the deepest workings, varying from 1,200 to 2,000 ft., is still of payable value. The mines are well hauled, and half a dozen of them will have long lives yet. The scattered outside mines of Western Australia

rock. This is just unpayable. In this locality the river bed seems to be of unusual width. Were it narrower, and the gold concentrated, the result would no doubt be payable. In any case there must be rich patches, and if some of these can be found before the company comes to the end of its resources, the shareholders will gain more confidence, and see the thing through. Other mines of the group—notably Victorian Deep Leads and Berry United—seem to have better prospects than Loddon Valley, if boreholes indicate anything, but are not so far advanced with their pumping. If these deep lead mines are successful they will turn out a great deal of gold, and this is the only source of fresh supplies that I see at present for Australia. In New Zealand there is not much doing in gold. The Waihi, now proved to the



The Loddon Valley Deep Lead Mine, Australia.

are in a bad way. The only one of these which has not yet reached its zenith is the Lancefield—an orebody 18 ft. wide and 1,400 ft. long, worth \$8. Owing to the presence of arsenic in the sulphide ore a somewhat complex dry-crushing, roasting, and cyaniding plant is now being installed. The general manager, H. C. Hoover, claims for this a 90% extraction with total costs of \$5.50.

The older goldfields of Australia—Ballarat, Bendigo, Charters Towers, Gympie, Hillgrove, and such like—all seem to be slowly dying. They still produce materially, but I think the next five years will show a serious falling off. Dredging has been fairly successful in Victoria and New South Wales, but the areas are limited.

The most interesting development in Australia just now is the big pumping scheme to drain the Loddon Valley deep leads, on which Waldemar Lindgren reported favorably. In the Loddon Valley mine, equipped for a water output of 11,000,000 gallons daily, the wash was entered some months ago. The average gold content exposed up to the present is about \$8 per fathom of bed-

8th level, is still a phenomenal mine. With, I think, 320 stamps it is now yielding \$13 per ton, or over \$300,000 per month. Its reserves, according to the last report, were figured at a million tons.

In Asia, the few gold mines are widely scattered. The mines of the Kolar district in southern India are the biggest producers. This field turns out about 50,000 crude ounces per month. The Mysore mine works what is perhaps the most persistent ore-shoot known in any quartz mine. At 3,600 ft. on the incline this orebody is still strong and of high value. The yield of this mine, crushing 15,000 tons per month, is over \$20 per ton! The adjacent Champion Reef mine was equally good to below 2,000 ft. Since then it has fallen off; but arguing by the Mysore, which is on the same vein, one is not prepared to say that it is finished. The smaller mines of this field, some of which are on the main Mysore vein, do not promise to do much below 2,000 feet.

The gold mines of Malaya are not of much importance, I except from this the Redjang Lebong mine, in Sumatra,

which, under difficulties of climate and situation, is a large producer, and may be a persistently good mine.

On my last trip to the East, embracing Japan, Korea, and China, I came to the conclusion that that part of the world did not offer gold mining opportunities. Japan, of course, is practically closed to us. The Japanese keep their own mines, and are also exploiting some small gold mines in Formosa. They have annexed everything in Korea not covered by earlier concessions, and will no doubt be assisted by their Government to work anything good. The American concession in Korea, on which are the Oriental Consolidated Co.'s mines, is an interesting low-grade concern, but some of its mines were looking poor in depth. It was here I saw the Korean miner at work, and decided that for his pay he is the most efficient in the world.

In China there is gold, but nothing like so much as people think. Even in Manchuria there is no development on which one can base estimates. There is no gold mine with standard equipment, so far as I know, in the whole of China. The political outlook does not favor mining exploration in these Far Eastern countries.

Siberia, to my mind, is the richest gold mining country in the East. At the same time, economic conditions are unfavorable for vein mining there. I should not like to handle a quartz mine in Siberia, for I think there are problems connected with the winter climate that have not yet been solved elsewhere. British capital is now building a number of gold dredges in different parts of Siberia, and arguing by the analogy of Klondike, they may work out their salvation. However, I am sceptical; Siberia's turn will come some day, for quartz mining too, but under present conditions the utmost caution is needed.

In Europe the headquarters of gold mining are in Hungary and Russia, but there is no expansion. The best equipped mine is the Twelve Apostles, in Hungary, with 185 stamps and very fine electrical equipment. It is low-grade and does not earn much now. This is the only gold mine I know that is entirely owned and run by Germans.

IRON IN CUBA.—The greater portion of the iron ore imported into the United States comes from the province of Santiago de Cuba, in the southeastern portion of the island, the mines being owned and operated by American companies. Of the four companies which mined iron ore on this island, two—the Sigua Iron Co., which operated in 1892 and 1893, and the Cuban Steel Ore Co., which was active in 1901 and 1902—have been abandoned. The Juragua Iron Co., the pioneer iron-ore operation, first shipped ore in the year 1881 and contributed, to the close of the year 1905, 4,238,683 long tons. The Spanish-American Iron Co., which made its initial shipments in 1895, supplied 3,022,283 long tons to the end of the year 1905. Iron-ore deposits also exist in other parts of the island of Cuba, a number of bodies of ore in the province of Puerto Principe being controlled by the Cuban Mining Company.

A CALIFORNIA JADE MINE.—The only jade mine in the United States is in the Klamath National Forest, Siskiyou county, California, where it was found last year. Samples of the jade were sent to Germany to be tested, and were pronounced to be of standard grade and capable of taking a high polish. Preparations are being made to develop the mine and ship the rock to Germany to be worked into ornaments. A permit for building a road to the mine has been secured from the Forest Service, which is especially charged with furthering in all possible ways the development of mines and all other National Forest resources.

The Prospector.

Enquiries sent to this department are answered free of charge, is submitted by subscribers who are not in arrears. The full name and post-office address of the sender must be given, otherwise no answer will be made. Those who are not subscribers must accompany their questions with a fee of \$3 for each question. No assays are made.

A piece of Specularite was received from J. S. of Bearmouth, Montana.

A specimen of Serpentine with galenite, pyrite, and chalcocopyrite was sent from Wallace, Ida., by J. J. M.

The three specimens of rock sent from Happy Camp, Cal., by M. L. G. are: No. 1, Gabbro; No. 2, Serpentine; No. 3, Serpentine.

The dike rocks sent by V. G. H., from Custer county, Colo., are: No. 1, altered Andesite; No. 2, rhyolite Porphyry; No. 3, Syenite.

A. J. N., of Radford, Yukon Territory, sends: No. 1, Quartz and Calcite carrying sphalerite, galenite, and chalcocopyrite; No. 2, altered Andesite; No. 3, fine-grained Marble.

Specimens marked W. from Goldfield are: No. 9, Quartz with horn silver; No. 10, Rhyolite; No. 11, mineralized andesite Porphyry; No. 12, mineralized Quartzite; No. 13, black Quartzite, No. 14, augite Andesite; No. 15, andradite Garnet; No. 16, Chalcedony; No. 17, iron-stained Quartz; No. 18, Andesite.

Rocks from A. P. B., of Luning, Nev., are: No. 1, Quartz, with garnets and pyrite; No. 2, Quartz, Andradite, Limonite, and Chlorite; No. 3, Quartz stained with iron; No. 4, Quartz stained with iron; No. 5, Quartz; No. 6, Quartz stained with limonite. No. 3 and 6 may be the gossam of a copper ore, and they might carry gold and silver.

THE DISCOVERER OF KLONDIKE.—Evidence has been gathered which shows fairly conclusively that to Robert Henderson, of Pictou, Nova Scotia, belongs the honor of being the discoverer of Klondike. In 1894 Henderson was outfitted at Ogilvie by his friend, Joseph Ladue. The summers of 1894 and 1895 he spent in prospecting the streams of the Indian River valley. During the winters of these years he mined alone on Quartz creek. In the summer of 1896 he discovered gold in Hunker Creek valley, or Gold Bottom, as he himself named the district. Provisions gave out in August, and Henderson was forced to go to Ogilvie for fresh supplies. On his way back to Gold Bottom, by the Klondike river, he spent a night on the present site of Dawson. It was here that he came upon Carmack. To Carmack, Henderson made known his discovery, and invited him to come up to Hunker creek and stake. Carmack followed in a few days, staked near Henderson's discovery and, returning, discovered gold in Bonanza creek. Of this discovery Carmack did not notify Henderson, but proceeded to Forty Mile, where he spread the news. At first his story was received with incredulity, but before long the stampede began, and the new finds were staked out before Henderson had been informed of their existence. Owing to complications, Henderson was refused a discovery claim on both Gold Bottom and Hunker branches of the river. He was, however, given the choice of staking one ordinary claim on either Gold Bottom, Hunker, or Bear creeks, or the equivalent of one out of five claims staked before others. Carmack's ingratitude lost to Henderson the chance of controlling the richest gold deposits of the North.—*The Canadian Mining Journal.*

Production of Copper.

The United States Geological Survey has issued a preliminary statement covering the production of copper in 1906. This has been prepared by L. C. Graton.

The production of copper in the United States in 1906 was 906,591,947 lb. This is an increase of about 18,000,000 lb. or 2% over the production of 1905 compiled on the same basis, and is a new record. The total is made up of Michigan's production of refined Lake copper and of the fine copper content of the production of blister. In the following table the production is apportioned to the States in which the copper was mined :

PRODUCTION OF COPPER IN THE UNITED STATES IN 1906.			
Lake Copper and Fine Copper Content of Blister.			
State.	Pounds fine.	State.	Pounds fine.
Alaska	8,885,648	New Mexico	7,099,842
Arizona	262,695,103	North Carolina	582,209
California	28,153,202	Oregon	545,869
Colorado	7,427,253	Tennessee	17,809,442
Georgia	17,182	Texas	51,377
Idaho	8,578,046	Utah	50,324,119
Massachusetts	9,744	Vermont	11,694
Michigan	229,635,730	Washington	290,823
Missouri	54,347	Wyoming	106,177
Montana	283,185,517	Total	906,591,947
Nevada	1,000,635		

Of this amount, 816,386 lb. in blister were produced in foreign smelters from materials exported from the United States. In addition to the total given, 51,543,116 lb. were produced as blister in domestic smelters from foreign ore, concentrate, and matte, while blister imported from foreign sources containing 136,826,906 lb. fine copper was electrolytically refined in this country.

The production of electrolytic copper in the United States in 1906, based on actual returns from all refineries was as follows :

	Pounds.
From materials of domestic origin	648,614,592
From materials of foreign origin	191,370,022
Total electrolytic copper	839,984,614

The figure for domestic production includes 24,017,833 lb. Lake copper which was refined electrolytically and an indeterminate but very small quantity recovered from scrap.

The production of domestic non-electrolytic copper refined by the furnace process and known as casting copper amounted in 1906 to 28,345,263 lb. This does not include Lake copper.

The total production of refined copper of domestic origin was :

	Pounds.
Lake (exclusive Lake electrolytic)	205,608,382
Electrolytic, total domestic	648,614,592
Casting	28,345,263
Total refined	882,568,237

Complete returns show that the following stocks were on hand at the Lake and electrolytic refineries at the beginning and at the end of the year :

Date.	Pounds.
January 1, 1906	118,244,028
January 1, 1907	92,470,792
Stocks depleted during 1906	25,773,236

These figures do not include undelivered sales. Stocks carried by consumers have not been estimated. In addition to these stocks at refineries, there was at smelters or in transit to refineries blister copper to the amount of 110,000,144 lb. on January 1, 1906, and 109,630,245 lb. on January 1, 1907.

The apparent consumption of refined copper in the United States in 1906 was about 680,000,000 lb. as compared with about 600,000,000 lb. in 1905. One method of deriving this figure is shown herewith:

CONSUMPTION OF REFINED COPPER IN 1906.

Total domestic refined copper produced in 1906	882,568,237
Imports for consumption, foreign origin	215,402,841
Stock at refineries January 1, 1906	118,244,028
Total available supply	1,216,215,106
Exports	446,750,711
Stock at refineries January 1, 1907	92,470,792
Total withdrawn from supply	539,221,503
Apparent consumption	676,993,603

This is in addition to the quantity, perhaps as much as 50,000,000 lb., which was recovered from old copper, drosses, residues, etc., and re-entered the market, mostly in the form of casting copper.

Reduction of Quicksilver.

The extraction of quicksilver from its ores is generally effected by dry processes. The ore (generally cinnabar, accompanied at times by small globules of native metal) is decomposed by heat and liberated mercury is volatilized, to be later condensed and collected.

In the retort the decomposition is effected by the use of some reagent, such as lime or iron. Here the mercury vapor is kept entirely separate from the gases formed by the combustion of the fuel used in heating the retort. In the furnace, the sulphur in the heated ore is oxidized by the air to SO₂. In this method the furnace gases come into direct contact with the ore and pass into condensers with the mercury vapor, as CO, CO₂, N, unused air, SO₂, etc. The use of retorts is practically limited to the treatment of rich ores, mercurial soot, and concentrate. However, they may be used to advantage in treating small lots of ore, in making test runs, etc., and on this account, together with their small initial cost as compared with furnaces, they are generally adopted as a means of reduction in first opening up a new property and preliminary to the building of a furnace. In comparison with the furnace, the retort has a very small capacity and the expense for fuel and labor is much greater. Retorts are also short-lived, burning out rapidly even when great care is exercised in firing. However, they have the advantage of yielding the mercury vapor in a concentrated condition and undiluted by the furnace gases which prove so harmful in condensation of the quicksilver. The furnaces in general use in this country are of the shaft-type, and may be classed as 'coarse-ore' furnaces, and 'fine-ore' or 'tile' furnaces. Omitting differences in detail between various styles, the coarse-ore furnace consists of a cylindrical brick shaft into which the ore, mixed with the proper amount of coke, coal, or wood, is charged at the top and the ashes and spent ore are removed at the bottom. A pipe, issuing from the upper part of the furnace, carries the mercury vapor and hot gases to condensers. This type of furnace is unable to handle fine ore successfully, so before the advent of the fine-ore furnace the fine material was of necessity briquetted before treatment. At present the coarse-ore furnace has been almost entirely done away with, the general practice being to crush the coarse material to 1 or 2-in. size and treat it in the tile furnace. The fine-ore or tile furnace consists of a number of narrow rectangular shafts situated side by side, each provided with a series of inclined shelves or tiles placed in the opposite walls. These shelves slope downward at an angle of 15° and force the ore, which is fed at the top of the furnace, to follow a zigzag path to the bottom, where it is discharged. The end walls of the shafts are provided with openings, which allow the flames from the fire-box to pass through the ore on the shelves. The volatilized mercury, together with the furnace gases, passes into a vapor chamber and then on into the condensers.

Hints on the Design and Construction of
Wooden Trestles.

By R. BALFOUR.

*Heretofore the predominant idea appears to have been that a timber trestle is a structure of a very temporary nature, which does not require care in its design nor good workmanship in its erection; whereas, if the same care were used in calculating the strains and strength of materials in a wooden trestle as are applied in designing steel trestles, there would be quite a different attitude on the subject.

In providing for the conditions under which the timber has to do its work, the value of its actual working strength is almost an unknown quantity, owing to vary-

wet weather comes again and swells this out at right angles to the direction of the strains. This alternative shrinking and swelling in time destroys the fibre or strength of the wood. This oversight on the part of the designers is the primary cause of nearly all the failures of wooden trestles.

A secondary consideration should be the facilities for renewal, that is to say, the bridge should be designed with sufficient strength that every piece in each bent can be removed one at a time and another one substituted, without interrupting the traffic over the structure.

Fig. 1 and 2 are submitted as general plans for trestles up to or over 100 ft. high. According to this plan there are no stresses on the side wood great enough to destroy the fibre of the wood. It is so designed that it

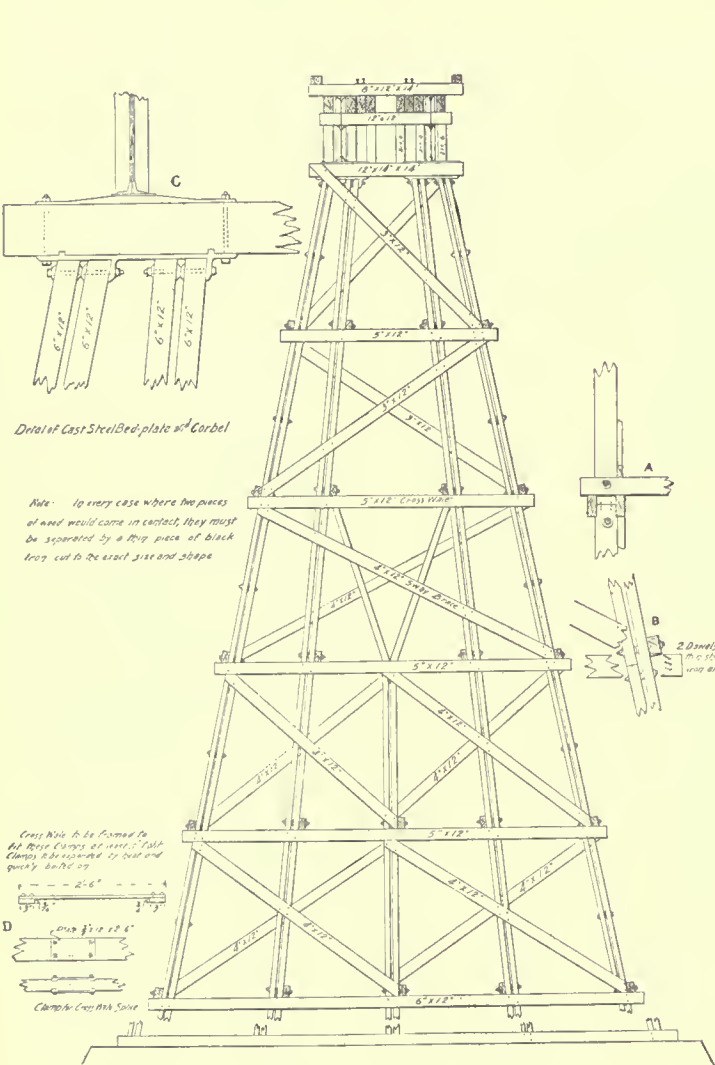


Fig. 1. Suggested Design for Timber Trestle.

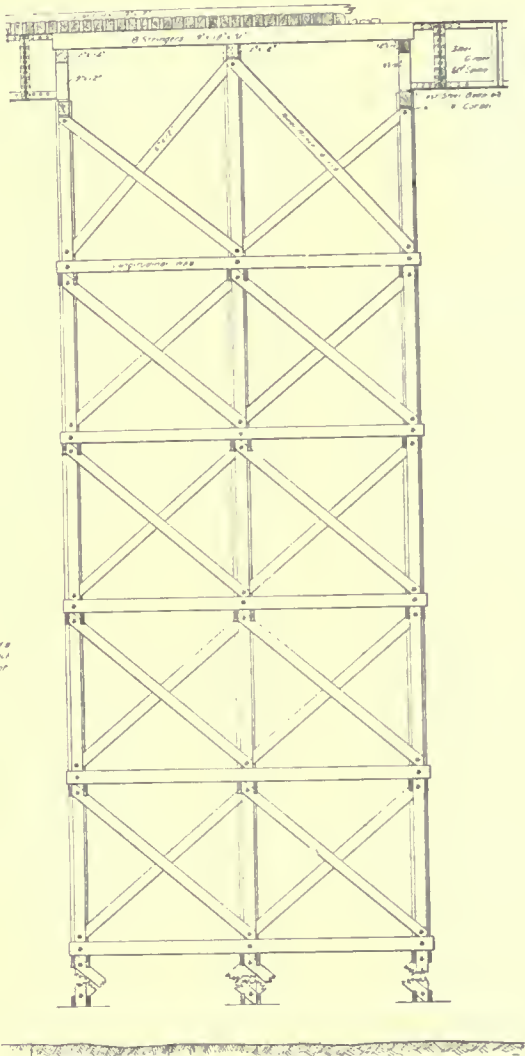


Fig. 2. Suggested Design for Timber Trestle.

ing atmospheric conditions. Particularly is this the case where the crushing strains come perpendicular to the grain of the wood. From personal observation, during an experience of 35 years, the writer has come to the conclusion that the safe working load, sidewise on hard pine, should be taken at 100 lb. per sq. in. in a moist climate, and varying in proportion to the dryness of the climate from that point to 200 lb. or even 250 lb. per sq. in. in very dry countries.

In actual practice it is more often strained 500 to 1,000 lb. per sq. in. During the wet weather the wood becomes soft and crushes together, and then afterward dries out, and in drying shrinks. The load coming on it holds it down to its smallest dimensions, and then the

can be removed piece by piece, and it is intended that all the timber in the structure shall be planed and painted. It is thought that its natural life should be from 25 to 40 years. The intention is to erect this bridge without being painted, but the precaution is taken to interpose a thin sheet of black iron between the intersection of any two pieces of wood throughout. It will be found that where unpainted black iron comes in contact with wood it is a preservative of the wood, and the oxidation of the iron answers the same purpose as an application of paint, so that when a structure is built of comparatively green timber, and thin black iron sheets are interposed between two members where they would otherwise come in contact, all the paint is supplied that is necessary at these particular points. Then after the timber has been seasoned in the work the exposed surfaces are painted.

*Abstracted by permission from the *Engineering News* of June 6, 1907.

It will be noticed in this plan that there is no direct sill or cap-sills. Instead of these, cross-wales are used, which are bolted and spiked on the sides of the posts at each 15 ft. in height, so that the load does not rest on the side wood. This holds at all places with the exception of the cap. Where the span is greater than 15 ft., the load on the cap will be too heavy to be taken up on the ends of the posts, as the posts would crush into the cap under the varying conditions of temperature, moisture, etc. To overcome this difficulty, cast steel corbel pieces are introduced on the head of the posts to give a greater bearing surface under the caps. Also on top of the cap where there are steel girders to span from bent to bent, a steel casting is used to distribute the load endwise along the cap.

Of course it will be necessary to have permanent foun-

means the destruction of one of the parts that is fastened by the spike. Therefore the best solution is probably found by bolting the ends of sway-braces and cross-wales to the posts, and using a 1/2 by 8-in. or 10-in. spike also at the ends, then spiking the other portions of these members to the posts. A large head on the spikes or perhaps, what is better still, a pressed washer on the head of the spike, is desirable.

Fig. 3 represents a general plan of a wooden trestle as usually built. This style of trestle has a batter of two inches to the foot (one in six). It has intermediate cap-sills and sill. Notwithstanding that this plan has the approval of two great corporations, it is faulty in many details. In the first place it has not sufficient spread to carry the great loads that are expected to go over it. The locomotives weighing over 100 tons and with a high

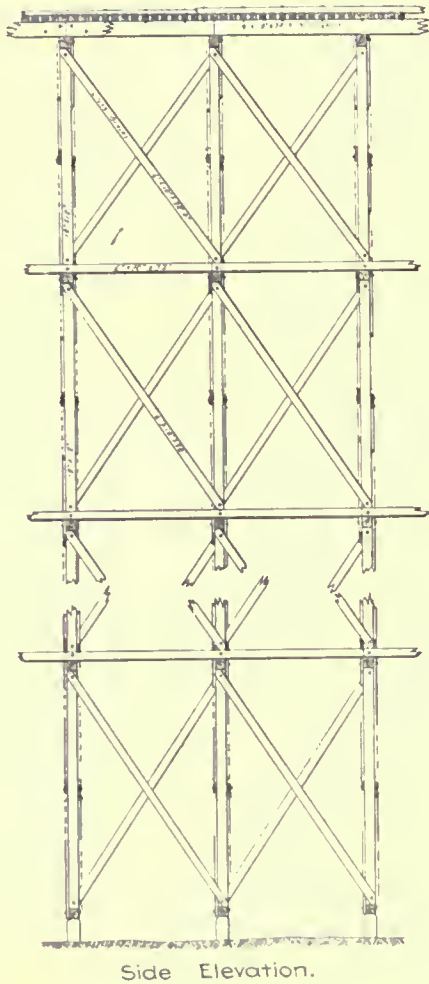
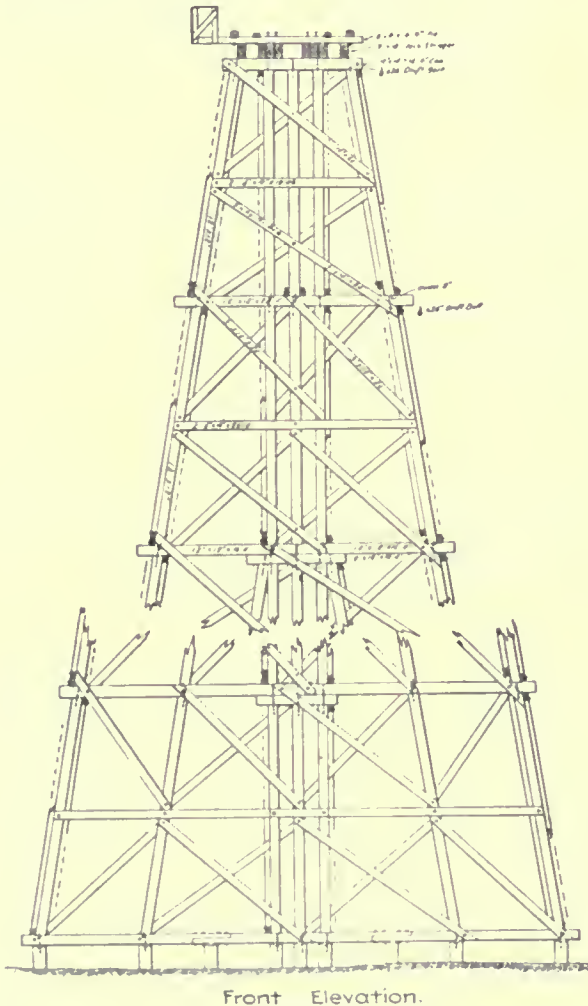


Fig. 3. Timber Trestle as Ordinarily Designed.

dations for a structure of this kind. If there is a concrete foundation, it might be well to have a cast or rolled steel plate imbedded in the upper portion of the concrete to receive the ends of the posts. If a stone masonry foundation is used, a good coping stone will be suitable to receive the posts by putting a thin sheet of rolled black iron between the posts and the stone.

There is room for a difference of opinion in regard to the fastenings for the different members. Screw-bolts are sometimes preferred on account of their adaptability for renewals; however, they do not necessarily prevent the initial movement of the structure, even if that movement is very small. And furthermore the safety of structures fastened with screw-bolts is entirely dependent on the care and watchfulness of the bridge repair gang. On the other hand, a spiked fastening effectually prevents initial movements, but in case of renewal of any portion of the structure the removal of a spike generally

means the destruction of one of the parts that is fastened by the spike. Therefore the best solution is probably found by bolting the ends of sway-braces and cross-wales to the posts, and using a 1/2 by 8-in. or 10-in. spike also at the ends, then spiking the other portions of these members to the posts. A large head on the spikes or perhaps, what is better still, a pressed washer on the head of the spike, is desirable.

Because of the rapid increase in the cost of Oregon or Southern pine, or similar hard pines, and to the great increase in the rolling load, it is probable that the day of wooden stringers has already passed, if true economy is sought in the designing of trestles. Steel girders of from 30 to 100-ft. spans will be cheaper than the ordinary 12

to 15-ft. spans of wooden stringers, when we take into account the cost of the bents.

Fig. 1 shows a side view of the proposed bents in the writer's design up to 100 ft. in height. The sizes of the posts are to be 6 by 12 in., and the longitudinal wales (end view shown in Fig. 1, and shown in detail *A*) should be 8 by 10 in., and 32 ft. long. Where two pieces of the posts butt on to each other, two dowels $\frac{3}{4}$ by 4 in. are used (see detail *A* and *B*), and a piece of black sheet iron of about 24 B. W. gauge, cut 6 by 12 in. and inserted between the ends of the two pieces of posts. Detail *C* shows a corbel under the cap to which the posts are fastened, and also a cast-steel bed plate on which the steel girder rests. Of course there will have to be some means of fastening the steel girder to the bed plate, which is not shown in the detail.

Detail *D* shows a means of splicing the cross-wales when they become too long to be furnished in the complete length.

Fig. 2 shows a side view of a tower to carry steel girders with 9 by 12-in. stringers over the tower. The tower braces are to be 6 by 12 in. throughout until the tower exceeds 100 ft., and the longitudinal wales to be 8 by 10 in. The ties on this plan are shown 8 by 12 in., but if greater economy is desired the 9 by 18-in. stringers over the tower might be kept 4 in. higher and use 8 by 8-in. ties over the towers, always using the 8 by 12-in. ties over the steel girder.

TALC IN NEW YORK.—There is a large production of fibrous talc from New York, which amounts usually in quantity to nearly double the talc obtained from all the other States, and is nearly all used in the manufacture of paper. The New York talc deposits are situated to the east and southeast of Gouverneur. They lie in beds of tremolitic limestone, which run conformably with the hornblende gneisses and related schists of the region. They are included in a range about seven miles long and one mile wide, in which parallel belts are indicated by several occurrences. Beds of a workable thickness of 12 to 15 ft. are common, while at Talcville a workable thickness of 70 ft. has been found in places. The talc was formed by circulating waters carrying carbonic acid acting on beds of tremolite schist in the limestone. The tremolite thus became hydrated and lost its calcium, which was carried off in solution as the carbonate. The beds of tremolite schist would have formed by the metamorphism and recrystallization of a highly silicious dolomitic limestone.

COLD SHORT is the term given to iron that will not stand working cold, bending, twisting, or punching very near the edges. Hot short is iron that will not work to good advantage while hot, but is strong when cold. Both kinds are suitable for their special purposes, but neutral iron is the kind to be relied upon for machinery. By neutral is meant iron that can be worked either hot or cold at ordinary temperatures. Good iron is often injured by being unskillfully worked. Care should be taken that the iron, while heating, is not exposed to the air. Iron heated for any purpose, especially for welding, should be heated as rapidly as possible, in order to expose it the least possible time to the action of the air and coal. For this purpose the strongest fuel is used with a strong blast. If in the operation of puddling the process be stopped at any particular time (determined by indications given by the metal to an experienced eye) in the furnace an iron is obtained of greater hardness and strength than ordinary iron, to which the name of semi-steel or puddled steel has been applied.

Decisions Relating to Mining.

Specially Reported for the MINING AND SCIENTIFIC PRESS.

The rule is that a mining licensee is without possessory right, and cannot maintain forcible entry and detainer or trespass, and, in short, is without any legal remedy whatever for injuries to the possession.

Continental Zinc Co. v. Amsden, (Mo.) 102 S. W. 1,087. June, '07.

A lease or conveyance of coal and other minerals with the right to mine the same for ninety-nine years, and a renewal in perpetuity, and by the terms of which the grantee was to render an account and pay royalties at specified rates when any coal or other mineral was mined, was held to contemplate a mining enterprise, and imposed on the grantee the obligation to make reasonable effort to operate such mines, and a failure to do so for more than twenty years amounted to a forfeiture by abandonment.

Brown v. Wilmore Coal Co., 153 Fed. 143. April, '07.

A coal and oil lease running for a long period of time, provided for a specified royalty, and that the operation of the mines should be begun and continued at the discretion of the lessee, and that no cessation of operation in mining should work a forfeiture; the lease was signed by the lessor only. In an action to forfeit the lease for failure to operate the mines, it was held that the lease was a mere unilateral contract, subject to cancellation at the instance of the lessor, and that the lessee having taken no steps to operate the mines thereunder for more than three years, could claim no rights by virtue of the lease.

Collins v. Abel, (Ala.) 44 Southern, 109. May, '07.

A right of action arises to the owner of the surface against the owner of the coal for injuries to the surface by the mining of coal when the support of the surface was so weakened that it might fall.

Tischler v. Penn. Coal Co., (Pa.), 66 Atlantic, 988. May, '07.

In an action to quiet title to certain mines where the defendant claimed that the plaintiff had abandoned such mines, it was held that a keeper was necessary and that his expenses were properly a part of the assessment work. But it was said that where a keeper was maintained simply to comply with the law relative to assessment work and to hold the property without any intent within a reasonable time to make use for the purpose of mining such structures as there may be thereon, and which he was employed to care for, then such expenditure should not be counted as assessment work. The expenditure, to count as assessment work, must be made in good faith, and it must reasonably be of personal use and benefit to the property as a mine by guarding valuable improvements made therein or thereon against deterioration or destruction, when such improvements may reasonably be said to be of value to the property as a mine.

Kinsley v. New Vulture Co., (Ariz.) 90 Pacific, 438, March, '07.

The lease of a mine provided that the lessee should leave sufficient pillars to support the roof, and for any breach of this condition the lease should be forfeited. The court decided that this stipulation was not a mere covenant, but a condition, the violation of which defeated the estate of the lessee, at the option of the lessor.

Greer v. Boston & C. Zinc Co., (Mo.) 103 S. W. 151, June, '07.

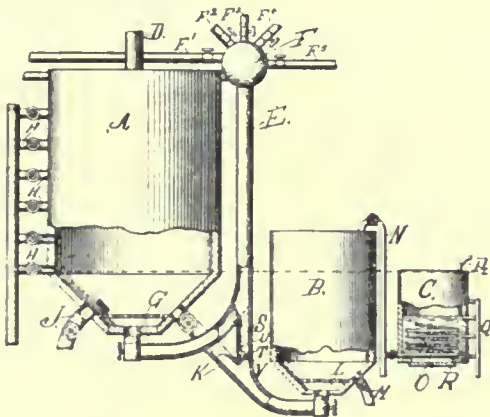
A lease of a mine provided that in certain event the lease should be forfeited at the option of the lessor and that notice of his option should be given by mail. In an action to forfeit the lease, it was held that notices sent by mail to the lessee at its place of business, followed immediately by a peaceable entry by the lessor was sufficient to terminate the tenancy.

Greer v. Boston & C. Zinc Co., (Mo.) 103 S. W., 151, June, '07.

MINING AND METALLURGICAL PATENTS.

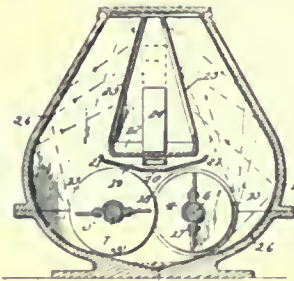
Specially reported for the MINING AND SCIENTIFIC PRESS.

METHOD OF TREATING ORES.—No. 853,575; James W. Boileau, Denver, Colo., assignor of one-half to James B. Knoblock, Denver, Colorado.



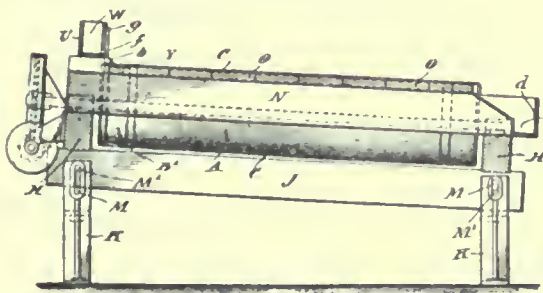
The method of treating ores which consists in putting the copper in solution by subjecting the ore in a pulverized condition to the action of a solution of an acid, salt, and water in the presence of air under pressure.

CRUSHING-ROLLS.—No. 853,481; Frank P. Snow, Los Angeles, California.



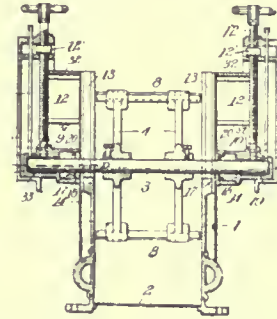
In a device of the character described, a pair of crushing rolls, a housing therefor, a screen above the rolls within the housing, and horizontally disposed means independent of the screen interposed between said screen and rolls, said rolls being constructed to throw the crushed material, by centrifugal force, up past said interposed means and against said screen, said means being constructed to automatically return to the action of the rolls material not passed through said screen.

ORE CONCENTRATING AND SEPARATING MACHINE.—No. 859,483; John M. Callow, Salt Lake City, Utah, and James W. Nell, Butte, Montana.



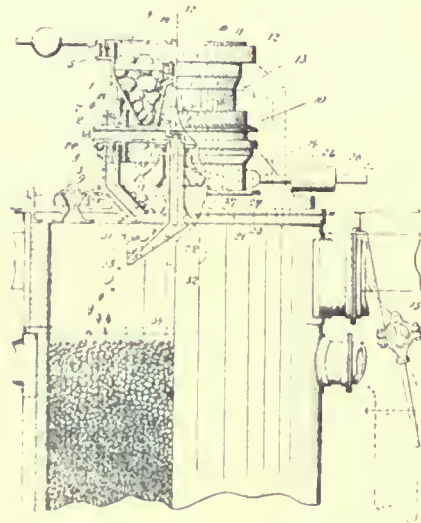
In an ore concentrating and separating machine, the combination with the endless traveling belt and end rollers, of a deck or carrying plane arranged beneath the upper side of the belt for supporting the same, said belt being provided on its under side at one edge thereof with a continuous relatively broad projecting portion, said deck having a co-operating guiding groove, said end rollers also having a groove registering with the groove on said deck and co-operating therewith for guiding the belt in a longitudinal direction to prevent the belt from slipping sidewise.

ELEVATOR-BOOT BEARING.—No. 853,443; William R. Cunningham, Bucyrus, Ohio, assignor to the American Clay Machinery Co., Bucyrus, Ohio, a Corporation.



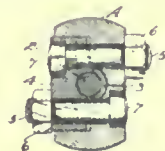
The combination with a casing and a shaft passing there-through, said casing having vertical slots or openings in which the shaft may be vertically adjusted, of housings exterior to the outer sides of the casing, journal-boxes or bearings in which the ends of said shaft are mounted, said boxes having closed outer ends and said housings being closed on their outer sides to form inclosed chambers in which the outer ends of the boxes are contained, said chambers forming vertical guides for the boxes, plates fixed to the boxes and extending parallel with the outer sides of the casing, and adapted to serve substantially as cover-plates for the slots of said casing to prevent material escaping there-through entering said boxes.

DEVICE FOR CHARGING FURNACES, GAS-GENERATORS, ETC.—No. 853,420; Hugo Rehmann, Mülheim-on-the Ruhr, Germany.



In a device for charging furnaces, gas-generators, and the like the combination of a hopper divided into three parts, and closable at the top, projections on the surface of the upper fixed part of the hopper, a crusher fixed on the rotatable middle part of the said hopper, projections on the surface of the crusher, means for moving the middle part of the hopper, means for periodically closing the lower fixed part of the hopper, and means for distributing the crushed coal at the outlet.

ROCK-DRILL CHUCK.—No. 856,877; Charles A. Hultquist, Lowell, Arizona.



A drill chuck having a socket to receive the drill shank, a key fitting a chamber upon one side of the shank, and adapted to be compressed upon the drill shank, bolts extending through the key and the chuck upon opposite sides of the drill shank, said bolts having cylindrical heads eccentric to the body portion, correspondingly shaped sunken chambers in the key and the chuck upon opposite sides adapted to receive the heads of the bolts and nuts.

Electrically Operated Hoist With Reels.

The accompanying illustration shows an electrically operated double-reel hoist driven through a double reduction of gears by an alternating current motor. The hoist is designed to handle a load consisting of 2,000 lb. ore in a skip weighing 2,000 lb. from a depth of 1,200 ft. at a speed of 500 ft. per min., the up-coming load being balanced by the down-going skip.

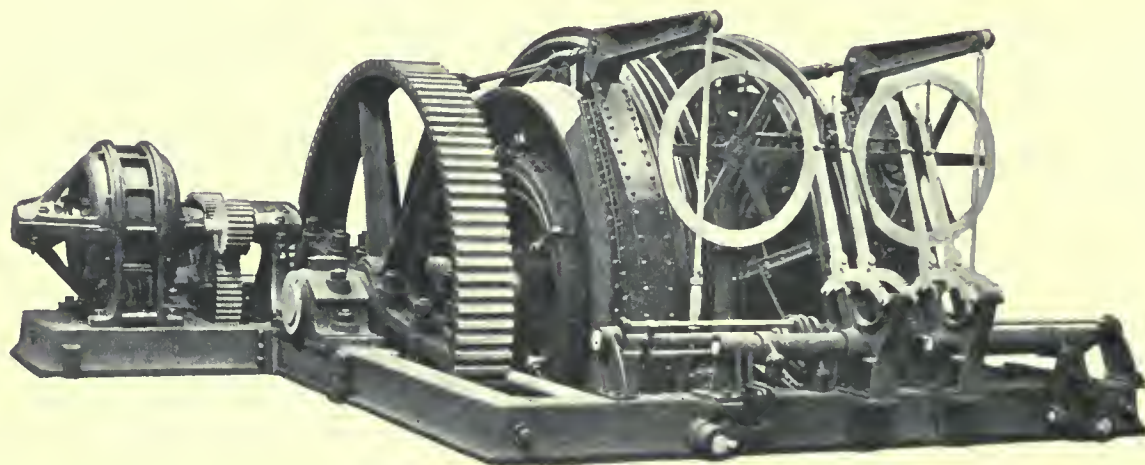
The hoist is supported on a cast-iron bed-plate of the inverted U type, hollow in section, and surrounding the entire machine. The reel-shaft rests in two large adjustable babbitted bearings and is designed to carry the maximum load without undue deflection. Each reel has a capacity of 1,200 ft. of $3\frac{1}{2}$ by $\frac{3}{8}$ -in. rope, and is fitted with a friction-clutch and post-brake. The reel-hubs are lined with bronze removable bushings which have a projected area giving a pressure of not over 80 lb. per sq. in. for the maximum load to which each is subjected. The friction-clutches are of the well known Webster, Camp & Lane type, which up to the present, is the most successful clutch made for mine-hoists. They are especially designed for

Books Received.

'Specifications for Street Roadway Pavements,' by S. Whinery. The Engineering News Publishing Co. Price, \$0.50, net.

'Commercial Organic Analysis,' by Alfred H. Allen, Vol. II—Part III. A well-arranged treatise on the properties, modes of assaying, and proximate analytical examination of the various organic chemicals and products employed in the arts, manufactures, and medicine, with the methods of detection and determination of their impurities, adulterations, and products of decomposition. P. Blackiston's Son & Co., Philadelphia. Price \$5.

'Gold Dredging,' by Capt. C. C. Longridge. Second edition; 325 pages. Price, \$6.50. The Mining Journal, London. Also for sale by the MINING AND SCIENTIFIC PRESS. This is an enlarged and revised edition of a volume, containing much valuable information in regard to dredging in West Africa, Australia, New Zealand, and other countries. It is largely a compilation, useful to those who want the information scattered through the technical papers and



Electrical Hoist With Reels.

heavy work, have few parts, are easily adjusted and require few repairs. They enable the operator to change levels with the least loss of time. The post-brakes are built up of steel plates and angles, and are provided top and bottom with suitable adjustments. The brakes are lined with basswood blocks, which, under the maximum loads, are subject to a pressure not exceeding 20 lb. per sq. in. The clutches and brakes are operated by hand levers, conveniently arranged at the front of the hoist. The hoist is fitted with a safety device, operated from the indicator, so arranged that if the skips are hoisted beyond a pre-determined point the brakes are automatically applied. Each reel is fitted with an indicator driven from the reel hub by heavy bicycle chain and sprockets with cut teeth. All the gears on the hoist have cut teeth of the short involute type. The electrical equipment consists of a General Electric, type I, 10-pole, 60-hp., 600-r.p.m., 1,040-volt, 50-cycle, 3-phase motor, having a full load of efficiency of 86%. The full load torque of the motor is 525 lb. at one-foot radius, and the maximum torque is approximately $2\frac{1}{2}$ times that amount. The insulation is tested to withstand 3,000 volts alternating current for one minute, and the temperature will not exceed 40° C. at rated capacity after 24-hr. run. The controller is provided with primary contacts, operating in oil, contained in the main controller cylinder. There are six running points, enabling the operator to run the hoist at several speeds continuously.

The resistances are of the standard iron grid type, the grids being assembled on skeleton frames and are air-cooled. They are designed for balanced hoisting only. This hoist is one of 12 reel hoists of various sizes for the mines of the Compañía de Real del Monte at Pachuca, in Mexico; it was designed and built by the Wellman-Seaver-Morgan Co., of Cleveland, Ohio.

the bulletins of the U. S. Geological Survey. The book is handsomely illustrated, it contains numerous drawings, and details of cost. Much prominence is given to manufacturers of dredging machinery and the advertisement of various engineering firms is a feature of the illustrations, but as this affords information to those engaged in the industry, it is a feature that may be pardoned by the purchaser, who will find himself in possession of a valuable compendium.

Catalogues Received.

The Ingersoll-Rand Co. has published Bulletin No. 2,010 on 'Crown Pneumatic Hammers,' and labor-saving devices operated by compressed air.

THE SULLIVAN MACHINERY Co. of Chicago, has issued Bulletin 56, on Sullivan Mining Hoists. This is an attractive little publication, containing cuts of some of the larger hoists installed by this company.

F. W. BRAUN has just issued Catalogue R, containing 450 pages describing the assayers and chemical laboratory apparatus and supplies, fine chemicals and reagents. The new quarters of the company are at 409 East Third St., Los Angeles, and 576 Mission St., San Francisco.

MOORE FILTER.—The three years' litigation involving the well known Moore Filter patents for treating slime has come to an end (as indicated in the advertisement to be found at the top of page 4 of this issue) with the result that all the rights, titles, interests, and claims now rest with the Moore Filter Co., whose New York office is at 40 Pine St. They are represented in the West by J. V. N. Dorr, 204 Bank Bldg., Denver.

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TABLE OF CONTENTS

Editorial:	Page.
Notes.....	157
Pioche.....	158
That \$29,240,000 Fine.....	159
General Mining News.....	161
Special Correspondence.....	166
Denver, Colorado.....	
Mexico City.....	
Butte, Montana.....	
Houghton, Michigan.....	
Toronto, Canada.....	
Salt Lake, Utah.....	
Johannesburg, Transvaal.....	
Concentrates.....	172
Discussion:	
Leachable.....	173
Mining Schools and Their Graduates.....	
.....George A. Packard	173
A Fundamental Problem.....	174
.....Howard D. Smith	
Articles:	
Benitoite.....	175
Pioche, Nevada.....	176
Production of Lead.....	179
Lodes in the Tertiary Eruptives of Colorado.....	
.....T. A. Rickard	180
Mining in New South Wales.....	182
Sinking Through Bad Ground.....	183
Coal Mining in California.....	186
The Prospector.....	179
Mining and Metallurgical Patents.....	187
Departments:	
Personal.....	160
Market Reports.....	160
The Blaisdell Pressure Filter.....	188
Catalogues Received.....	188
Commercial Paragraphs.....	188
Publications Received.....	188
Dividends.....	188

Editorial.

BETWEEN the United States and her noncontiguous territories there is a trade amounting, in 1907, to \$67,250,586 of exports and \$74,807,690 of imports, exclusive of the \$18,583,702 worth of gold shipped into the United States from Alaska. That northern territory took nearly \$1,000,000 worth of iron and steel manufactures, chiefly machinery, in 1907. The imports are three times and the exports six times as much as they were ten years ago. Manifestly Alaska, Hawaii, Porto Rico, and the Philippine Islands afford openings for a further expansion of trade.

IT HAS BEEN SUGGESTED to us that the American Institute of Mining Engineers should hold one of its proximate sessions on the edge of the Grand Canyon, in Arizona. There are two excellent hotels affording all the necessary accommodations for 500 people and there is a room large enough for meetings. The geological interest of the Grand Canyon and the splendor of the scenery need not be emphasized. There are no large mines or smelters in the vicinity, but it is not far to Jerome or Prescott. A series of lively sessions, with well sustained discussions, might be better than much sight-seeing.

THE METAL MARKETS are dull, because there is a great disinclination on the part of buyers to operate, and in consequence stocks are accumulating in the hands of producers. While during the time of the depression, reports from the West were encouraging in a general way, so far this has not affected the metal industry; on the contrary. The iron and steel business, which had kept up at full steam until a few weeks ago, is now also showing some signs of falling off. In copper the market is entirely nominal, with only a small retail business doing. While the larger producers are nominally holding for a price of 22 cents for electrolytic, there are sellers below 21 cents without finding buyers. In lead, consumption appears to have fallen off materially of late, and stocks have accumulated in the West as well as in the Eastern refineries. This accounts for the break in prices from 6 to 5.25 cents. Of late, however, there is slightly more demand, but, as far as we can see, only enough to take care of present production, not of the accumulation. Spelter has been declining very heavily, and is now quoted at 5.75 to 5.80 cents. Manufacturers are loath to commit themselves by contracting ahead.

ON ANOTHER PAGE we publish a useful article describing the sinking of a shaft in bad ground. It was prepared by an engineer, Mr. F. W. Adgate, on the staff of the company responsible for the work, namely, the Foundation Company, which makes a

specialty of such engineering contracts. This article, or portions of it, may have appeared in other journals, but without giving the name of the author or his connection with the company whose operations he describes. The matter is of interest as bringing up the general question of the relation between the editor and the advertiser. Our own policy is simple. We believe that it is our duty to give our readers the best technical information obtainable, and when it comes from persons associated with advertisers, it is only right to say so. Not that the information is necessarily vitiated by coming from one who is connected with the enterprise described, but as an evidence of good faith. Obviously an article signed by a member of the profession is worth more than the unsigned descriptive matter issued by the publicity bureaus of manufacturers.

IF THAT \$29,000,000 is collected from the Standard Oil Company, it is suggested that it might be used to build battleships, to be christened after the men at the head of the monopoly. What a piratical squadron it would be. The Jolly Roger might represent H. H. Rogers, the John D. and the Arch Bold would be dangerous, and the Harriman certainly would never be afraid of water, even far from Wall Street. Their ensign would be a hymnbook from a Cleveland Sunday school, a ticker upon a yellow field rampant, with the motto underneath: "The public be damned."

NEWSPAPERS publish many things that are palpably foolish and it is curious how some that are obviously incorrect go the whole round of the press without eliciting correction. A weird yarn has outcropped in many of our exchanges and appears now in the scrap-heap of *Tit Bits*, to the effect that Mr. John Hays Hammond gets the largest professional income in the world and that he possesses "such infallible knowledge of the value of gold-bearing ore that he can pass unerring judgment upon mines without visiting them." As to the salary, that is an affair into which it would be impolite to inquire, for it is none of our business. But as to this appraisal of mines at long distance it is fair to Mr. Hammond himself to deny such an absurdity, in fact, we would call it a libelous misrepresentation calculated to injure the position of an engineer in so high repute. It is worthy of mention because there may be younger men desirous of emulating such a method of mine inspection and it may be that there are professors so academic as to lecture approvingly on this new method. But it won't do. To examine mines means hard work on the ground, personal attention to details, and an intimate acquaintance with working conditions, as Mr. Hammond knows better than most of us. Moreover even if enthusiastic youngsters and thoughtful professors are not misled by this suggestion of short cuts to big fees, it is likely that the pseudo-expert, who is always with us, will adopt the method as convenient and remunerative. Think of the well known Col. Boomfixer at New York or the eminent Mr. Thomas Spoof N. Y. Z., etc., at London being able, on account of their eminence and scientific attainments, to polish off reports at short notice

on the Great Wildcat Unlimited or the Hot Bullion Consolidated without even getting on a train, without the weariness of a long journey, the hardships of beans and bacon, the exposure to thirst in Esmeralda county, or the lack of stimulating society in Siberia. We grieve that the public should be endangered by the suggestion of a new device for making money easily and of a scheme calculated to destroy the usefulness of those engineers who by hard work and study of local conditions have equipped themselves for the giving of professional advice. But it is not true. We venture to say so without referring the matter to Mr. Hammond. It is a sad joke. Once more, it is apparent that when you see it in the daily press, you can be sure it is not so.

Pioche.

PROMINENCE is given in this issue to an article on Pioche by Mr. James W. Abbott. The revival at Pioche is another manifestation of the renaissance of Nevada, and it is due to the construction of a branch railroad, an enterprise stimulated in turn by the increasing interest taken in the mining regions of the Great Basin—that vast tract of arid treasure-land that stretches from the Rockies to the Sierras. We wish good luck to Pioche; may she rise strengthened from the slumber of the years and come forth vigorous with renewed youth to assert her place among the mining camps of Nevada. Mr. Abbott tells the story of other days and the hopes of these. He mentions names well known to the veterans of the profession. The Charles E. Hoffman of Pioche's beginning died a few weeks ago in Mexico. He lived at San José and was formerly connected with the mines of New Almaden. Although a noted mining man, this Hoffman must not be confused with Charles F. Hoffmann, of Oakland, the mining engineer who is father of a family of capable technical experts now scattered from Dawson to Johannesburg. Then there is a reference to Alexis Janin. He died in 1897. The three Janins—Louis, Henry, and Alexis—were notable men in the early mining history of the Pacific Coast and two of them survive happily today. Mr. Henry Janin is at London, no longer in practice, but still in touch with the profession. He made the first expert report on the Meadow Valley mine. Mr. Louis Janin is one of the trustees of the State Mining Bureau and gives younger men the benefit of his ripe experience. He spends a large part of his time on a farm in southern California. The assayer at Pioche in 1868 was Gardner F. Williams, until lately the general manager of the De Beers Consolidated mines at Kimberley, another Californian who has proved the value of an early environment of mines and mills. C. A. Stetefeldt died in 1896. His process held a large place in Western metallurgical literature twenty years ago, but it was not widely applied, being adapted to a restricted class of ore. It stimulated research and had a theoretical value greater than its commercial application. Processes come and go, mines have their day, but mining goes on increasing in importance and complexity. Thus, long after Brigham Young has passed

away in a mist of tradition, long after the old silver mills have become obsolete, the stage coaches of Gilmer & Salisbury are replaced by the reckless automobile, and the mule train is succeeded by the vestibuled Pullman. After a long wait, Pioche has come to her own again. More power to her.

That \$29,240,000 Fine.

A FEDERAL JUDGE in Illinois has imposed fines aggregating \$29,240,000 upon the Standard Oil Company, for violation of the Interstate Commerce Law in accepting rebates on freight due for the transport of oil. The amount looms large in the public eye and it is said that the decision of the Court will be contested on the ground that it is a "cruel and unusual punishment" contrary to the Constitution of the United States. But the judgment is not likely to be upset on this score, for the constitutional provision referred to was designed to guard against torture and inhuman methods of execution, and not cumulative sentences. Undoubtedly the moral effect of the sentence would have been as great if the minimum fine — \$1,000 for each of the 1,400 infractions of the law — had been levied. For it is improbable that the persons responsible for the wrongdoing will be punished. The Standard Oil Company has only to increase the price of its product in order to make the public pay the \$29,240,000 to the Government. This illustrates the difficulty of disciplining a monopoly. The individuals responsible are not reached by such a sentence. The corporation itself is a legal fiction. The Standard Oil Company is controlled by a group of daring financiers, although the majority of its stockholders are small investors innocent of wrongdoing. Those responsible for the rebates will escape. Similarly, the Chicago & Alton Railroad, which gave rebates to the oil company whereby its freight rate of 18 cents was reduced to 6 cents per hundred pounds, is largely the property of small investors. The company is to be indicted, and is likely to be mulcted for infractions of the law. Is a further tax to be put upon the shareholders and bondholders of the railroad that Mr. Harriman has almost wrecked by his unscrupulous dealings? Is the trust fund to pay for the maladministration of the trustee? Having been used by Harriman as a means of making concessions to the pirates of the Standard Oil, must the railroad investors suffer further from the illegal acts of their officers? We trust—and we speak feelingly as a bondholder in a small way—that the effort to assert the law will lead to the punishment of the individuals who are responsible and that the innocent investors no less than the community at large may be protected against men who under the guise of trustees for shareholders are playing their own high-handed game.

We have heard much of the trial at Boise lately and the leaders of a union have been held up as anarchists. We regard H. H. Rogers, John D. Rockefeller, and E. H. Harriman as in effect no less anarchists than Emma Goldman, W. D. Haywood, and Clarence Darrow. The

last three do in a rough brutal way what the first three accomplish in a polished skillful manner. One group undermines, the other over-rides, the law. The \$29,240,000 looks big, but it is only a small part of the money filched from the people of this country by a corporation that exists by permission of the law and under the protection of it. If the fine is legal, we hope to see it collected; if not, if it is set aside by a higher court, we hope new laws may be passed whereby larceny *in excelsis* will be checked.

Once more it is impressed upon us that the natural man is predatory, and this brute instinct is evinced most strongly by the substratum and super-stratum of humanity. It is only the code that saves the community from destruction. Men must be bound by the iron bands of law, otherwise they make depredations unceasingly. It was thought that corporations could be controlled through their organization. This has proved a delusion, for they only act through their agents. It becomes necessary to make those agents liable under the criminal statutes. Existing legislation appears to be inadequate, but if public opinion asserts itself there will be a demand for punitive enactments to bridge an existing hiatus. Economic conditions are progressive in their development, and they demand new laws for new crimes. The motive power for such action must come from an enlightened public opinion, without which the law is a dead letter. Meanwhile let us recognize the foes of popular government in the men that deliberately use legal methods to thwart the law. Bracket Rockefeller with Emma Goldman, and Harriman with Haywood. Anarchy is utter disregard for government; the definition fits the case.

WILD-CAT AND HIGH-GRADING are terms that have been accepted in the language of mining. The first is not new, it is probably forty years old, having originated in connection with reckless banking just before the civil war when one particular bank, organized under loose State laws, became notorious. On the notes of this bank there was the figure of a wild-cat or *felis catus*. It became a synonym for reckless promotion. In Australia, as is well known, rabbits are a pest, except in Western Australia, where they do not exist. The desert has served as a barrier. During the boom days ten years ago it used to be said that the West Australian wild-cats had prevented the rabbits from invading the country from the Eastern colonies. From 'wild-cat' we have obtained 'wild-catter,' a dealer in feline finance. The other term, 'high-grading,' originated we believe at Cripple Creek. It refers to the stealing of rich ore. At Goldfield and Cobalt it has become a familiar word, and indicates the prevalence of a form of petty larceny most demoralizing to honest work. Both 'wild-cattening' and 'high-grading' refer to criminal offences and it is curious how such slang terms by their false suggestion of humor are calculated to glose the essential wrong of the acts they describe. 'Graft' seems a humorous variation of 'theft.' Wild-cats are swindles, high-graders are sneak thieves.

Personal.

S. F. EMMONS is at Cananea.

WALDEMAR LINDGREN is at Denver.

POPE YEATMAN has returned to New York.

J. R. FINLAY is in Custer county, Colorado.

D. A. LOUIS has returned to London from Egypt.

MARK R. LAMB is at Porters Hotel, Mexico City.

W. H. ARGALL is on his way from London to Uruguay.

J. P. WALLACE, lately at Laredo, Texas, is now at Goldfield.

J. P. HUTCHINS sailed from Seattle for Nome, on August 5.

FREDERIC J. SIEBERT will be at Goldfield for several months.

CHARLES B. LEWIS, of Nacozari, Sonora, is at Los Angeles.

HOWARD D. SMITH has gone to Los Angeles, on his way to Mexico.

MARTIN SCHWERIN has made a report on the Buffalo mine at Cobalt.

S. H. BROCKUNIER, of New York, is in California, examining clay deposits.

G. W. MILLER, of Denver, is examining mines near Poocatello, in Idaho.

DEANE P. MITCHELL is manager for the Zinc Corporation at Broken Hill.

WILLIAM BAYLEY SR., of the Gold Roads Mines Co., in Arizona, is in Europe.

TOM R. JONES is superintendent for the Buffalo Mines Ltd. at Cobalt, Ontario.

J. P. GAZZAM was in San Francisco this week and has gone to Jamestown, R. I.

C. D. WHITE, who is mining near Trinity Centre, was recently in San Francisco.

ARTHUR GOODALL, manager for the Fremont Con. Mining Co., in Amador, is here.

W. J. LORING is general manager in Australia for Bewick, Moreing & Company.

R. H. BURROWS has returned to Guanajuato after a long journey in eastern Chihuahua.

JAMES W. NEILL is directing the construction of a dredge on the Merced river, California.

WILLIAM WARR, engineer for the Blaisdell Co., has returned from Mexico to Los Angeles.

C. W. ROBBINS, of Custer, South Dakota, is superintendent of a mine near Del Norte, Colorado.

F. L. BOSQUI has been appointed metallurgical engineer for the Goldfield Consolidated Mines Company.

EDWARD SKEWES has returned to Huddersfield, England, from the inspection of mines in Hungary.

DAVID GOODALE, manager for the Rio Tinto Mining Co., at Chihuahua, sailed for Honolulu on August 8.

FRANK ROBBINS is at Euseñada in Lower California; he expects to return to Los Angeles about August 20.

S. R. PORTER, superintendent for the Gold Roads Mining & Exploration Co. of Arizona, is at Los Angeles.

LOUIS WEBB, formerly at Cambridge, Mass., and now at Montagu, in Shasta county, California, visited San Francisco.

H. B. BARLING, lately in Ventura county, is now superintendent of the Yellow Rose mine, in Trinity county, California.

E. A. H. TAYS is at Butte, after a journey to Nova Scotia. He intends to make permanent headquarters at Denver.

C. W. MERRILL, metallurgist to the Homestake Mining Co., was not on the ill-fated *Columbia*. That was another man with the same initials. Mr. Merrill has returned to Lead, South Dakota, after a visit to California.

Latest Market Reports.

LOCAL METAL PRICES—Aug. 8.

Antimony.....	17.00@20.00c	Quicksilver (flask).....	838@39.50
Copper.....	24.00@25.00c	Spelter.....	7.25@ 8.00c
Pig Lead.....	5.35@ 6.30c	Tin.....	43.25@44.75c

ANGLO-AMERICAN SHARES.

Cabled from London.

	July 25.	Aug. 8.
	£ s. d.	£ s. d.
Camp Bird.....	1 0 9	1 0 3
El Oro.....	1 8 9	1 5 0
Esperanza.....	2 3 9	1 18 9
Dolores.....	1 6 3	1 5 0
Oroville Dredging.....	0 16 6	0 16 6
Stratton's Independence.....	0 2 6	0 2 6
Tomboy.....	1 11 3	1 8 9

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

SOUTHERN NEVADA STOCKS.

San Francisco, Aug. 8.

Atlanta.....	\$ 60	Laguna.....	1.50
Belmont.....	3.10	Little Tonopah.....	1.50
Columbia Mtn.....	59	Manhattan Con.....	45
Combination Fraction.....	2.17	Midway.....	74
Daisy.....	1.67	Mizpah Extension.....	20
Fairview Eagle.....	1.15	Mohawk.....	17.00
Florence.....	5.10	Montana Tonopah.....	3.00
Gold Bar (Bullfrog).....	65	Nevada Hills.....	5.75
Gold Bar (Goldfield).....	—	Red Top.....	4.00
Goldfield Con.....	8.12	Sandstorm.....	44
Goldfield of Nevada.....	1.50	Silver Pick.....	58
Gold Kewanas.....	78	St. Ives.....	93
Great Bend.....	73	Tonopah Extension.....	1.45
Jim Butler.....	89	Tonopah of Nevada.....	12.00
Jumbo.....	4.00	Tramp Con.....	40
Jumbo Extension.....	1.97	West End.....	68

(By courtesy of W. C. Ralston, 368 Bush St.)

MINING STOCK QUOTATIONS—NEW YORK.

	Closing Prices	Aug. 1.	Aug. 8.
Bingham Central.....	1 ¹ / ₈	7 ¹ / ₈	
Boston Copper.....	25 ³ / ₈	22	
Cumberland Ely.....	8 ¹ / ₈	7 ¹ / ₈	
Dolores.....	6 ¹ / ₂	6	
El Rayo.....	4 ¹ / ₄	4 ¹ / ₈	
Guanajuato Con.....	3 ¹ / ₄	2 ⁷ / ₈	
Giroux Con.....	8	7 ¹ / ₈	
Greene Con.....	25	14 ¹ / ₂	
Nevada Con.....	13 ⁷ / ₈	12 ³ / ₄	
Nipissing.....	8 ¹ / ₈	7 ¹ / ₈	
Tennessee Copper.....	36 ³ / ₄	35	
Tonopah Ex.....	15 ¹ / ₈	1 ¹ / ₂	
Tonopah-Belmont.....	3 ¹ / ₈	3 ¹ / ₈	
Tonopah.....	13 ¹ / ₈	11 ³ / ₄	
United Copper.....	59 ¹ / ₄	58 ³ / ₈	
Utah Copper.....	29	25	

(By courtesy of Hayden, Stone & Co., 25 Broad St., New York.)

COPPER SHARES—BOSTON.

	Closing prices.	Aug. 8.		Closing prices.	Aug. 8.
Name of company.....			Name of company.....		
Adventure.....	2 ¹ / ₄		Michigan.....	12	
Abmeek.....	75		Mohawk.....	70 ¹ / ₂	
Allouez.....	38		Nevada Con.....	12 ¹ / ₂	
Amalgamated.....	78 ¹ / ₂		North Butte.....	72	
Arcadian.....	5		Old Dominion.....	35 ¹ / ₂	
Atlantic.....	11		Osceola.....	118	
Balaklala.....	7 ¹ / ₈		Parrot.....	16	
Bingham Con.....	13 ¹ / ₄		Phoenix.....	1	
Boston Con.....	21 ³ / ₄		Quincy.....	106	
Butte Coalition.....	20 ¹ / ₂		Raven.....	1 ¹ / ₈	
Calumet & Arizona.....	154		Rhode Island.....	4	
Calumet & Hecla.....	740		Santa Fe.....	2	
Centennial.....	23		Shannon.....	14	
Con. Mercur.....	39		Superior & Pittsburg.....	11 ¹ / ₂	
Copper Range.....	71 ³ / ₄		Tamarack.....	87	
Daly-West.....	13 ¹ / ₄		Trinity.....	17 ¹ / ₂	
Franklin.....	12		United Copper com.....	57 ³ / ₄	
Granby.....	14 ¹ / ₈		Utah Copper.....	42	
Greene-Canaan, ctf.....	15 ¹ / ₄		Victoria.....	6	
Isle Royal.....	15 ¹ / ₄		Winona.....		
Mass.....	5 ¹ / ₄		Wolverine.....	145	

(By courtesy of E. F. Hutton & Co., 490 California St.)

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.

Date	Electrolytic Copper	Lead	Spelter	Silver
Aug. 2.....	19 ¹ / ₄	5 ¹ / ₄	5.85	69 ¹ / ₄
" 3.....	19 ¹ / ₂	5 ¹ / ₄	5.85	69 ³ / ₈
" 4.....	Sunday.	No market.		
" 5.....	19 ¹ / ₂	5 ¹ / ₄	5.85	69 ⁷ / ₈
" 6.....	19 ¹ / ₄	5 ¹ / ₄	5.85	69 ⁵ / ₈
" 7.....	19 ¹ / ₄	5 ¹ / ₄	5.85	69 ³ / ₈
" 8.....	19 ¹ / ₄	5 ¹ / ₄	5.85	69 ³ / ₈

General Mining News.

ARIZONA.

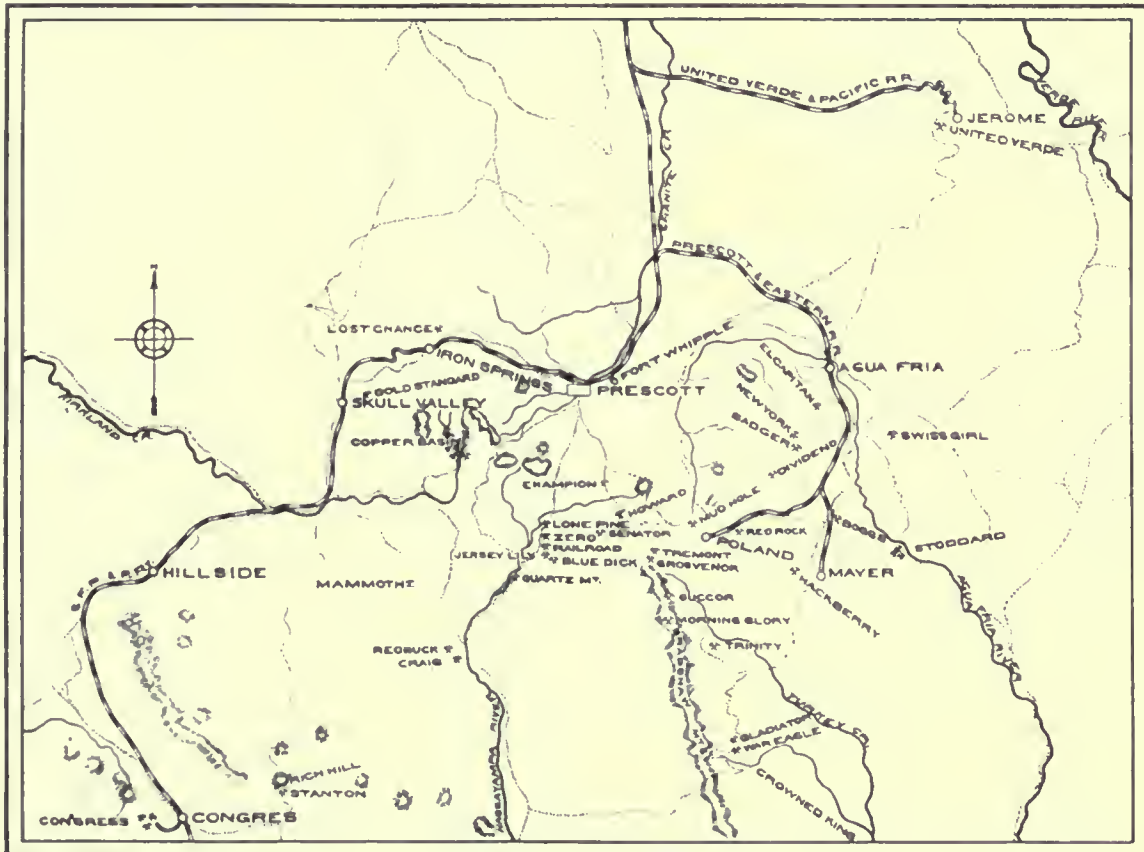
COCHISE COUNTY.

The spur of the E. P. & S. railroad to the Denn shaft will soon be completed, and the ore-bins will be erected at once. Sinking is being done in the shaft, and it is down 1,175 ft. The drift on the 1,100-ft. level is encountering softer ground and more water, and the drift on the 1,000-ft. level is being extended. Shipments will probably start about September 1.—A full force of miners is employed at the Shattuck-Arizona, and 300 tons of ore per day is mined. The new compressor building is nearly finished. The drift on the 900-ft. level continues in low-grade ore, and development continues on the 700 and 800 levels.—The shaft on the Warren R. & D. Co.'s ground is down 285 ft.—The buildings for the machine-shops of the Calumet & Arizona will

to water-level before any driving is done, which will probably be at about the 400-ft. point. W. N. Clute is the manager.—Perhaps the largest work under way in the entire Bisbee district is the power-plant being erected by the Copper Queen company on a site between the Gardner and Sacramento shafts. It is their plan to furnish with this plant all air, steam and electricity consumed in their mines. The foundations are already in and the work of putting up the steel frame of the building will begin shortly.

YAVAPAI COUNTY.

A payment of \$28,000 will be made to the former owners of the Monica group of mines, in the Kirkland district, by the Monica Mines Syndicate, as an installment on the purchase price. This makes \$73,000 in all paid to date.—Four miles north of Crown King, in a shaft immediately south of the Bradshaw Mtn. railroad track, what appears to be one of the most promising strikes recently made in the Bradshaw mountains, was uncovered a few days ago on the



Map of a Part of Arizona.

be finished in two months. At Douglas the new power-house will soon be finished.—A large block of leached ground has been opened on the 1,000-ft. level from the Biggs shaft in the Superior & Pittsburg; the shaft is being sunk toward the 1,100-ft. point, where a drift will be started. The new Prescott pumps are being installed on the 1,100-ft. level in the Junction shaft. Some ore has been opened by the lower levels from the Hoatson shaft, but has not been much developed.—The C. & A. company has purchased the Leadville properties in Turquoise district in the Dragoon Mtn., and John Talbot will be in charge of the work there.—A new wood-lined pump has been put in at the Holbrook shaft of the Copper Queen, to withstand the corroding action of the acid water. The Czar shaft is being enlarged to make room for the pump columns.—The Cochise Development Co. is sinking its shaft, and a new gasoline hoist has been erected at the shaft of the North Bisbee D. Co.—It is reported that the Verde Green Copper Co., composed of Minnesota shareholders and operating 15 miles west of Benson, has cut into a body of lead carbonate ore. Ore is being hauled 12 miles to Patana, whence it is shipped to the Luna smelter at Deming.—The shaft of the Bisbee Extension company is down 345 ft. and is altered limestone, with some iron and copper stains. The shaft will be sunk

properties of the DeKalb Mining Co. At a depth of 30 ft. in the shaft a pay-streak was struck sampling 106 oz. silver and 58% lead. The find was made in a vein running in a northeasterly and southwesterly direction through a schist belt about 200 ft. wide, which cuts through the granite formation.—Recently a deal was perfected by which the Mountain View group of mines, in the Turkey Creek district, passed from F. A. Bletcher to the Liberty Mines Co., a corporation organized by local capitalists. In a short time a force of men will be started sinking one of the shafts in which there is an excellent showing of lead-silver ore. There is a plentiful supply of water on the ground for camp and other purposes and the group is within easy reach of the Prescott and Crown King wagon road.

Newton Evans, general manager of the Signal Copper Co., owning the Copper Prince group of mines in the Bill Williams Fork district, has gone to New York to complete the sale of the property to Eastern copper interests.—J. P. Moffett and Perry O. Spittler returned from the Thumb-Butte Co.'s mines, 18 miles northwest of Castle Dome, and report a new strike of silver and copper glance near the surface.

A deal is pending in the Patagonia mining district that will involve about 100 gold and copper mining claims, many

of which have been opened, and a few have operating plants and machinery on them. Aside from the mining claims, the deal, it is said, will include the Patagonia town-site.—A gold strike has been made north of Palomas by J. Fred Nottbusch. A shaft has been sunk 10 ft. and the ore in it assays \$12.40. Location work on five claims is in progress.—There is a rumor that the people who have the Mayhew Strike under bond will soon pay the amount due on the property and come into full ownership. The amount agreed upon was \$350,000, and the first payment was \$12,000. The men who bonded it lost no time in development, and recently ore was struck in the North Star claim, in a new shaft.

CALIFORNIA.

KERN COUNTY.

(Special Correspondence).—A strike of considerable importance has been made on the ridge north of Indian creek, in the Amalie district. This ridge runs east and west, and along its apex is a massive outcrop of quartz and quartzite, in which are found mineralized veins and stringers of varying widths, rich in silver sulphide and antimonide. These veins occur both parallel and at right angles to the outcrop. Several samples taken across them assayed about 40 oz. silver, some of them running as high as 300 oz. The property is being opened up by the locators, who are getting shipping ore from near the surface.

NAPA COUNTY.

The La Joya mine, near Oakville, a property that has not received much attention in the past, has recently been opened up and drift has encountered high-grade cinnabar ore, lying just above a black alta and beneath an altered serpentine. The development has thus far been done by tunnels, but a winze will be sunk near the end of a 1,400-ft. tunnel in search of ore beneath the black alta. If satisfactory results are obtained by this winze a long adit will be run at a lower level.

NEVADA COUNTY.

Good progress is being made in the tunnel at the Fairview mine, above Relief hill. The tunnel is in 500 ft. and will have to go 400 more before the vein will be cut.—The company that is opening up the Giant King mine, near Washington, is building a sawmill near Phelps hill.—The organization that has been working the Austin quartz mine in Willow valley, has been incorporated under the name of the Nevada County U. G. M. Co., with a capitalization of \$500,000. The directors are H. A. Moss, Lathrop B. Bullene, W. W. Rose, F. E. Ware, and W. S. Beard.

PLACER COUNTY.

The old Homestake quartz mine, near Forest Hill, has been opened up again.—The Crater shaft is being unwatered.—It is reported that the old Hazard mine, in Volcano, may be worked again.—Work on the Southern Cross has been resumed under the charge of R. J. Trimble.—A contract for sinking 100 ft. at the Bellevue has been let.—Drifts are being run from the 200-ft. point in the shaft of the Gold Blossom mine. The one toward the east is in 250 ft.—Work is progressing on the Imperial. The old mill has been taken from Pat Goggin's mine to Big Oak Flat, and will be set up there. Wm. Duffey is the superintendent.—J. T. Gavin has finished the tunnel on the Ceanothus mine, adjoining the Mayflower, and has struck the gravel channel. The channel has been opened for 100 ft., and the gravel at the head of the new tunnel prospects well.—The old Mamaluke mine, on Georgia hill, is being prospected again. In the new tunnel at the Eureka 15 men are employed, under J. A. Ferguson.—Several of the officials of the Northern California Gold Mines Co. have recently visited the Herman mine.—About 20 men are at work on the old Bonanza mine at Gold Run, owned by the Gold Run Gravel M. Co., of which J. D. Stewart is the superintendent. The company has practically rebuilt the 10-stamp mill, and 30 stamps will be added. A new compressor has been erected, and the mill will be run by water power, the water coming from the Yuba river, through the Miners' ditch. The company plans to work the cement gravel that was left when the loose overburden was hydraulicked off. The working tunnel is in 2,000 feet.

SAN BERNARDINO COUNTY.

The Victor Gold M. Co. has four 175-hp. boilers in place in its new power plant at Needles, and the 700-hp. steam engine will drive an electric generator. The new 120-ton mill is nearly finished and the hoist is in place. The tubemill and cyaniding equipment have arrived, and the pump to furnish 240,000 gal. water is at Kingman. The company claims to have about 100,000 tons of ore developed that will average \$20 per ton.—The Gold Road company is also planning to erect a power plant at Kingman, and transmit electrical power to its mines.

SHASTA COUNTY.

The new machine-shop of the Mammoth Copper Co. is 400 ft. long and equipped with a traveling crane. The grading is finished for the new 250-ft. stack, and the powerhouse is being enlarged. At the mine, the big tunnel has been started. This will be 18 ft. wide, to accommodate a double track for electric haulage from the ore-chutes to the gravity train.—H. H. McClure, of Bully Hill, has sold three placer claims on Squaw creek to George T. Slaughter of Delamar.

SIERRA COUNTY.

A crew of 30 men is employed at the Sovereign mine in making surface improvements. The new ditch and road have been completed, the ditch for power purposes having a capacity of 1,000 miner's inches under a head of 230 ft. A lower tunnel is being run that will tap the vein 460 ft. deep, and grading is being done for a 20-stamp mill. Horace Morse is superintendent and George F. Taylor is consulting engineer.—C. H. Porier has examined the Alice, Pappoose, and Plummer claims for the Eastern Exploration Co. A 5-stamp mill is kept running on good ore.—Richard A. Riepe and Al Burton have taken a 60-day option on the Rosasco mine, three miles from Downieville. Three tunnels have been run on the property.—It is reported that 60 of the 125 men at the Sierra Buttes property near Sierra City will be laid off, and the No. 9 mill of 40 stamps on the river below the town will close down, leaving only the 20-stamp mill on the mountain running.

The 10-stamp mill at the Rainbow mine is making a satisfactory run. The upper tunnel will be extended south along the vein to prospect for another ore-shoot.—The Tightner vein is said to have been cut in the long development tunnel of the Rio Antiguo M. Co., operating on the South Fork property at Forest. The tunnel is being driven to tap the gravel deposit discovered many years ago by the Bald Mtn. Ext. Co., but several quartz veins have been cut by it.—A pocket of rich ore was discovered on the outcrop of the Tomboy vein in Lucky Dog ravine. The property is owned by Bixby & Son of Forest, and a cross-cut tunnel is being driven to cut the vein 100 ft. deep.

SISKIYOU COUNTY.

The Sheba mill on Patterson creek, in Scott valley, is ready to start.—J. H. Tibbetts has taken a bond from the Hegler brothers on their mines on Humbug creek. A 400-ft. cross-cut tunnel will be run on the property, which consists of five claims, near the Mono mine. An old tunnel is in 700 ft., and a five-stamp mill is on the ground.—The mill is running at the Mt. Vernon mine at the Greenhorn and Cherry Creek divide.—E. M. Brown will be in charge of I. O. Jillson's copper property at Whiskeytown.

COLORADO.

CLEAR CREEK COUNTY.

The old Dunbarton group of claims on Saxon Mtn., owned by John N. Stewart and Frank Strausser, is being worked again. These properties produced good silver-lead ore several years ago. The lower adit has 135 ft. to go before cutting the vein, and the upper adit, that is in 780 ft., is being cleaned out.—A find has been made in the Vidler tunnel openings, in a cross-cut from the main tunnel. The ore carries lead and copper. The main tunnel is in 4,450 ft., of which 700 ft. was driven on the west side of Argentine pass.—Behr & Fraser, operating a lease on the Bellevue-Hudson, have recently shipped 100 tons of ore to the Denver smelters. This is turning out to be one of the most important strikes made this year in the Columbia Mtn. dis-

trict. It is rumored that the company will ship concentrating ore to the custom mills at Idaho Springs. Machine-drills have been installed and work in the mine is progressing rapidly. John A. Holmberg is the manager.—The Plebian mine, on Columbia Mtn., is being worked through the Claypool tunnel. McKarahan & Parks are operating the property.—The Black Prince cross-cut of the Alaska holdings, situated on Green Lake Mtn., is in 100 ft., and will soon cut the vein.

IDAHO.

BLAINE COUNTY.

The suit that involved the Independence mines at Hailey has been dismissed and active operations should soon be resumed on this property.—A good body of ore has been cut in the Oriental group of mines on Rock creek. A drift has followed the ore for 175 ft. These claims are bonded to R. T. and Matt Tustin.

CUSTER COUNTY.

The Empire Copper Co. has been organized to take over the White Knob Copper Co. and the Macbeth lease, at Mackay. For the past 18 months the owners of the Macbeth lease have been operating the smelter formerly owned by the White Knob company, treating the ore from the mines of this company. The new incorporation was effected under the Maine laws, and the capitalization is for 1,200,000 shares of \$5 each. Frank M. Leland is the president and manager, and on the board of directors are John C. Montgomery, John H. Hobbs, Thomas J. Barbour, and R. L. Moffett. The company owns 38 claims and a mill and smelter, and the copper ore is said to average 4%. The mines are connected with the smelter by a seven-mile railroad, on which a Shay locomotive is run. Probably the old Van Nostrand tunnel will be continued, to tap the mine at depth. The 500-ton smelter produces copper matte that is shipped to Murray for treatment.—There is some talk of extending the Salmon River branch of the Oregon Short Line, which now terminates in Mackay, to the Salmon river.—The Brim brothers, who have been working the old Horn Silver mine at Era under bond, have struck a rich body of horn silver ore.

IDAHO COUNTY.

The Buster mine, at Elk City, should soon be a producer. A crew of thirty men is employed under Joseph Thorn. The raise from the upper tunnel to the surface has been finished and a 10-stamp mill and cyanide plant will be built.—Another vein has been discovered by James Larsen and W. G. Litchfield, in the 80-ft. tunnel in the Last Chance mine, adjoining the Buster.—Hopkins and Cone will install a small mill on the Eureka group of claims in the Newsome district. The property is developed by 550 ft. of work.—The Meadow Creek M. Co.'s new 25-ton mill, engine, boiler, air-compressor, and three drills have been shipped from Buffalo. Twelve men are employed at the property, and more are wanted.—The Golden Rule placer has had a prosperous year, and the owners, Tledeman, Boseh, & Crisman, will enlarge the eight-mile ditch for next season's run.—On the Townsite property in the Steckner district, owned by Steckner, Thorn, & Brown, the tunnel is in 250 ft. and in 50 ft. more will tap the vein at a depth of 150 ft. The Big Elk and the Big Buffalo properties adjoining have good showings of ore.—The Hercules tunnel is in 450 ft. and taps the vein 250 ft. deep.—Jack Henniger reports the discovery of sulphide ore near the wagon-road at the west end of the Gold Dove, near the Lilly May.—A mill will be built at the Twin Butte property in the Orogrande district this summer.—Pat Brennan, who has been running the mill at the American Eagle under a short lease on the dumps, has secured a two-year lease on the entire property and will run the mill throughout the fall and winter.—The stamp-mill and cyanide plant on the Crackerjack mine, at Buffalo Hump, is running continuously and 22 men are employed. A year's supply of milling ore is blocked out in the mine.

OWYHEE COUNTY.

At the Village Blacksmith mine, near Silver City, work is being continued north in the drift that is in over 400 ft.

One ore-shoot has been passed through. A raise is being run between the two veins, for a double-compartment shaft on which an electric hoist will operate.—The 120-ft. shaft on the Commoner, purchased a year ago by the Security Mining Co., of which Lee Bunch is the head, is to be unwatered. This mine is near the old Golden Chariot, on War Eagle. The same company has bonded the Bullion and Yellow Jacket properties.—The Addie mill has been started for an experimental run on Potosi ore. Screens of 40-mesh are used and some gold is saved on the plates, but the saving in the pans has not been satisfactory and a table has been placed below the pans. About 600 tons will be treated in this experimental run, and battery samples show a value of \$56 per ton. Stopping has begun in the south drift from No. 2 level, and No. 2 level south, now in 470 ft., is being driven farther. The shaft will be sunk 100 ft. deeper, and work has been discontinued in the drift on



The Coeur d'Alene, Idaho.

No. 2 north, because an influx of water was feared from the creek above.—The Banner company has ordered a four-stamp Nissen equipment, that will be erected at the south end of the Coeo claim, in Long gulch, recently purchased by the company from the Lewis brothers. The new mill will be connected with the present main tunnel by a tram-track 1,000 ft. long, on the west side of Coffee gulch, and electric power will be purchased from the Trade Dollar Con. Co. The ore will be amalgamated and concentrated. In the mine, work is being continued in the north and south drifts from the tunnel level, and the raise for a shaft is within 70 ft. of the drift on the upper Banner level.

NEVADA.

CHURCHILL COUNTY.

(Special Correspondence).—Good ore has been found in both shafts on the Nevada Wonder, and development is under way.—At the Jack Pot the recently discovered vein showing up well, and shipments will soon be made.—It is reported that good quartz has been found in the lower level of the Ruby Wonder shaft.—At the Vulture, ore is being sacked for shipment, and the vein is looking well.—Active development is under way at the Hidden Treasure, Ajax, Blue Jay, Lost Chord, and Daisy.—Gasoline is selling at 60c. per gal., and as all the hoisting is done with gasoline engines, the problem of obtaining it cheaper is important.—Miners are getting \$5 per day and are

scarce.—Water is brought eight miles from Bench Creek by pipes, and is sold at fair rates.

Wonder, August 1.

ESMERALDA COUNTY.

(Special Correspondence).—The production of the mines and leases of the Goldfield district for the week ended August 3 was 3,930 tons, valued at \$479,400. Of this amount, 2,482 tons, valued at \$310,250, was received by the Nevada-Goldfield reduction works from the following: Mohawk Florence, 375 tons; Mohawk Jumbo, 485; Mohawk Combination, 450; Mohawk, 440; Red Top, 275; Frances Mohawk, 80; Higginson, 130; Hayes & Monnette dump, 145; McNaughton, 60; Combination Fraction, 42 tons. The average value of the ore was estimated to be \$125 per ton. This is the heaviest production yet made in this camp.—At a meeting of the directors of the Consolidated Mines Co., held in this city today, it was announced that arrangements had been made for the retirement of the company's debt to B. Baruch, of New York, by which arrangement he and his associates would take treasury stock. This will leave the company free from debt with a large surplus. The directors will meet about Sept. 1 for the declaration of regular dividends. Charles W. Geddes, formerly of the Guggenheim staff, was appointed general superintendent of the Con. properties. The directors also decided to proceed with the preliminary work on the new mill.—The Goldfield output for July was 16,666 tons, with an estimated value of \$2,146,255.—The station on the 285-ft. level in the Kalfus shaft, in the Mohawk Combination lease, is completed, and driving on the vein will start at once.—Some excellent ore has been struck on the Red King claim.—The Daisy M. & L. Co. is about to ship 10 tons of ore from the 200-ft. level.—Ore has been struck in the 260 level of the Red Top. The vein is several feet wide and of fair grade.—Ore has just been encountered in the Gold Bar.—Goldfield and Colorado interests have purchased the Goldfield Storm King group. A shaft will be sunk on the principal claim.—The Frances Mohawk lease on the Wedge has struck some good ore. The shaft is being sunk an additional 100 ft.—A promising shoot of ore has been struck in the main shaft on the Great Bend No. 2 at Diamondfield. The strike was made on the 300-ft. level.—The Mohawk Co. has received \$85,900 for 90 tons of ore shipped to the smelter July 5, an average of over \$950 per ton.

Goldfield, Aug. 3.

NYE COUNTY.

(Special Correspondence).—The shaft at the Montgomery-Shoshone has reached the 550-ft. level, and a large flow of water has been struck. The cross-cuts on the 300 and 400 levels are in ore. The mine is shipping 125 tons of ore per week to the smelter, and it is expected that the mill will be ready for service by September 1.—At the Homestake excellent ore is being developed, and it appears that the value of the orebodies is holding with depth.—Development work is progressing at the West Extension, some excellent ore having recently been encountered in the south drifts. It is stated that a mill will soon be erected by the company. The Bonnie Claire is developing a large orebody. The 20-stamp mill is operating on good ore. Crude oil is used for fuel.—The Pittsburg Silver Peak 100-stamp mill at Blair is nearing completion. A large tonnage of ore running about \$14 per ton is blocked out. It is expected that the cost of mining and milling the ore will be \$5 per ton.—The stories circulated about the wonderful richness of the new camp of Eddy, in this district, had little foundation in fact. Investigation proved that the orebodies exposed on the surface gave out with depth. Rich silver ore was found, but existed only in one or two small pockets. When two small prospect pits demonstrated that the supposed veins failed to exist, the interested parties gave it up in disgust.

Rhyolite, July 29.

WHITE PINE COUNTY.

(Special Correspondence).—Reports state that the Consolidated Copper Co., with a capitalization of \$50,000,000, has been organized by Eastern interests to take over the

Nevada Consolidated, Cumberland Ely, and Ely Mines Co., in this district and properties in Bingham, Utah. The Ely group will be absorbed on the basis of one share of Ely for three shares of Consolidated. The others will come in later. The merger will embrace 2,880 acres of mineral land.—The Cumberland Ely is preparing to sink a new shaft on the Veteran group, and machinery for that purpose has been ordered.—Two No. 5 churn-drills have arrived for the Giroux company, and will be used for prospecting, and for tapping the water-bearing strata for additional water for the concentrators.—The Wedge shaft on the Cumberland Ely is being sunk as rapidly as possible, and some good ore has been encountered.—The Badger shaft at the Ely mines is down 200 ft. Cross-cutting on the vein is under way.—Three shifts are sinking the Chainman shaft, and the 160-ft. level has been reached.—On the Federal-Ely a tunnel is being driven to



Map of the New Mining Districts of Nevada and California.

tap the ore at depth. The Queen of the West shaft is down 100 ft. in sulphide ore.—Two churn-drills are operating at the Ely Giroux Extension, and some promising copper ore has been discovered.—The line from the Star Pointer shaft to Ely, a distance of eight miles, has been completed.—The surface equipment of the Joana shaft has been installed, and sinking will soon start.

Ely, August 1.

OREGON.

BAKER COUNTY.

George W. Boggs has secured a 10-year lease on the Peacock mine in the Seven Devils district. He claims there is ore developed that will pay to ship to Council.—The Razos Mining Co. has been formed in Sumpter to take over John Thomsen's group of claims in the Cornucopia district.—Ira Lemon has run a 200-ft. tunnel on his claim in the Greenhorn Mtn.—The Heppner coal mines will not be worked this year. The owners have spent several days in looking over the property.—A good coal stratum is being uncovered at the Lucky Boy mine, south of Bonanza, by Al. P. Johnson.

LANE COUNTY.

A contract has been let for more work on the Golden Slipper property on Horse Heaven creek, Bohemia, by Frank Tarkington and J. M. Gowdy.—Work continues at the Vesuvius with good results.—The Clarke brothers are developing their combination mine at Bohemia.—A force

of men is employed at the Baltimore G. M. Co.'s ground in the Champlon basin.—Eggin & Sweet, who own the Sunrise group of claims on Adams Mtn., will build a wagon-road to the property.

WASHINGTON.

FERRY COUNTY.

(Special Correspondence).—Continued improvement is apparent at the Copper Key mine. From the stope near the surface the ore appears to be extending in all directions, and a drift runs northward from it 30 ft. that is entirely in ore.—Four Medford smelting furnaces have been received by railway for the Colville M. & S. Co., and there is another one in transit.—Some gold-bearing iron sulphide ore is being extracted from the Pin Money shaft, on the Oversight group. There is about a earload ready for shipment.—At the Winnipeg mine only one machine-drill is working at present, with two shifts. Miners are hard to get. The tunnel is in 950 ft., has passed through a syenite dike, the foot-wall of the vein, and has gone through 25 ft. of ore.—A strike of ore is reported on the Monitor group on Missouri Mtn.—Mining activity is increasing at Park City camp, additional wagon-roads are under construction, and the creeks are being spanned by bridges. Some copper ore is being extracted from the Hercules claim, below the Ramore Co.'s property.—The Columbia group is producing some rich silver-lead and copper ore.—During the past six weeks an adit on the Mountain View group has been driven 115 ft. and has about 280 ft. further to run to strike the main vein, 114 ft. deep, a contact between limestone and porphyry. The vein is 5 ft. wide, and some of the ore will assay \$16 per ton. The Mountain Maid vein on this group has been traced by sinking five shallow shafts.—The core-drill on the North Half group of the Colville M. & S. Co. was started July 20, and a vertical hole will be drilled 150 ft., at which depth it is expected to penetrate the silver-lead vein that is reported to be at the contact between trachyte and stratified limestone. The exploratory work thus far reported by the superintendent is an open cross-cut, a drift 20 ft. north, and another 10 ft. south on the vein. From the surface workings 15 tons of ore have been mined. About 15 tons more are reported to be in sight. The assays, as reported, run from \$50 to \$116 per ton, the principal value being in lead, with some silver and gold. Open work similar to that already done is planned to be duplicated every 50 ft. along the course of the vein, to determine its extent.

Republie, July 26.

(Special Correspondence).—The Oversight M. & M. Co., originally owning four claims on the south of Belcher Mtn., now owns 11 claims. Considerable exploratory work has been done on the group, at a comparatively small outlay, with satisfactory results. E. J. Delbridge is the manager. The exploitation of the group has resulted in uncovering several deposits of iron oxide and sulphide ore, characteristic of the neighborhood. The work consists of about 1,300 ft. of adits and drifts, 200 ft. of shafts from 20 to 80 ft. deep, and about 40 test-pits from 5 to 15 ft. deep. With the exception of a few of the latter the workings have disclosed low-grade ore, but the extent of the deposits has not yet been determined. The equipment of the property consists of a 15-hp. gasoline engine and an 8 by 10 in. straight-line air compressor. At the No. 1, 2, and 3 adits are large log ore-bins filled with ore awaiting shipment. The company owns also a 300-ton bin at a siding on the Belcher Mtn. railroad. The veins of the Oversight group are contacts between diorite, limestone and metamorphic sedimentaries. In the case of the Pin Money vein the hanging wall is diorite, and the foot-wall is slate. An overflow of trachyte covers the apex. A general average of the iron sulphide ore developed in the group is estimated at \$2.58 in gold and 10c. in silver per ton, \$3 in excess of iron, 1% copper, 42% sulphur, and 2% lime. There is sufficient copper in the ore to cover the slag losses in smelting and enough sulphur to furnish the matte. From a total gross value of \$5.60 per ton must be deducted the costs of mining, transportation, and treatment reported as follows: Mining, 75c.; freight and smelter charges, \$3.55; incidental expenses, 30c.; making the total expenses \$4.60,

and the net profit approximately \$1 per ton. The shaft has been sunk 80 ft. and drifts of 100 ft. have been driven on the Pin Money vein.

Republie, August 6.

BRITISH COLUMBIA.

The Rossland mines shipped the following tonnages during the week ending July 27: Centre Star, 3,420 tons; Le Roi, 1,925; Le Roi No. 2, 385; and White Bear, 105 tons of ore. Total for the week, 5,835, and for the year, 157,277 tons. There was a shortage of ears throughout the district, which curtailed the output. Ore from the old Centre Star dumps, which was taken out 10 years ago by Oliver Durant, is being shipped to the smelter. A prospecting shaft is being sunk on the Idaho, and cross-cutting is being done from the Centre Star shaft to the vein on the 13th level. The only work that has been done on the 14th level is to cut a station and put in an ore-pocket.—At the White Bear, development continues on the lower levels with good results.—A couple of earloads of ore are ready to be shipped from the Nest Egg property.

The Consolidated company's Trail smelter, in addition to Rossland ores, received the following shipments during the past week: Snowshoe, Phoenix, 2,297 tons; St. Eugene, Moyie, 512; La Plata, Kokanee, 132; North Star, East Kootenay, 68; Spokane, 34; Arlington, Erie, 26; Keystone, 25; Standard, 23; Rambler-Cariboo, Sloean, 23; Haitney, 6 tons of ore.—The Le Roi smelter, at Northport, received 1,925 tons of ore during the week, that was treated in three furnaces.

From Phoenix are reported the following shipments: To Granby smelter from Granby mines, 20,832 tons. To British Columbia Copper Co.'s smelter from the Mother Lode, 5,117; from Snowshoe, 1,785; from Oro Denero, 1,905; from Mountain Rose, 59 tons. To the Dominion Copper Co.'s smelter from Brooklyn, 1,440 tons; from Idaho, 288; from Rawhide, 2,485; Sunset, 1,365. To the Trail smelter from the Snowshoe, 2,635 tons. Total for the week, 39,911, and for the year, 648,575 tons of ore.—The Boundary smelters treated ore as follows: Granby, 18,223 tons; B. C. Copper Co.'s smelter, 10,938; Dominion Copper Co.'s smelter, 5,578 tons of ore. Total for the week, 34,739, and for year to date, 633,947 tons of ore.

The Consolidated M. & S. Co., of Canada, Ltd., has declared its regular quarterly dividend of 2½%. The properties of the company are showing favorable development.—The Granby smelter is producing a earload of copper per day, that is shipped to New York to be marketed. The Granby company owns 1,168 acres in the Boundary district.—The members of the New York syndicate having an option on the Gold Drop group on Wallace Mtn., West Fork, are expected to arrive soon in the Boundary.—Work is progressing at the Sudbury, in Deadwood camp, where a new electric hoist has just been placed in position.—Ten stamps are dropping at the Cariboo-McKinney mine, and the other ten stamps that are in the mill will be repaired and started.—The Black-Mackay Co. is employing 14 men in the Cambrian mine at Moyie. The company will be reorganized under the name of the Cambrian Mining Co., Ltd. A shaft will be sunk in the lake, at a distance of 250 ft. from the shore, where the water is 60 ft. deep.—The company operating the Payne mine at Sloean has been reorganized with a capital of \$500,000.—Some good ore is being struck in the Richmond group, near Sandon.

MEXICO.

SONORA.

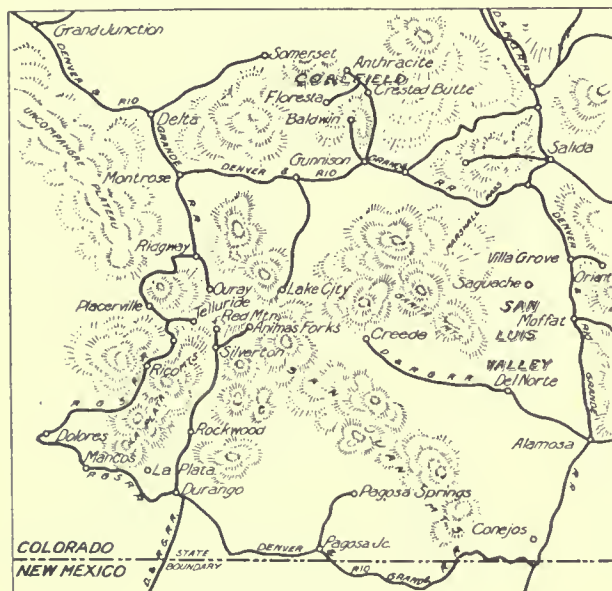
The 60-stamp mill of the Greene Gold-Silver Co. has been in continuous operation since the first of the year, and with the treatment of between 150 and 200 tons of ore per day, earnings have approximated \$3,000 per day. Most of the money, however, is being put back into the property, and the mill is being enlarged so that within 60 days its capacity will be increased by 40 additional stamps. Owing to the introduction of some improvements the management is of the opinion that with 100 stamps in operation a total of 500 tons daily can be treated and at the same time costs can be reduced. An average of about \$10 per ton net is figured by the company against \$5 as average cost of operation.

Special Correspondence.

Denver, Colorado.

Creede.—Recent Discoveries.—Another Smelter at Canyon City.—Scarcity of Labor.—Sulphur in Colorado.—A Mica Mine.—Development in the Findley.—New Mill for the Independence.

Creede is a Colorado camp that attracts little newspaper comment, but which maintains a steady and considerable production of lead and zinc ores. The rich silver ores that first attracted attention to the district are now a matter of little moment, and, indeed, the Holy Moses, where the first discovery happened, made but little profit for the owners. Recently some very rich silver ores have been opened up on Campbell Mtn., and the properties there may perhaps give good account of themselves. One feature of the camp is the almost complete absence of the technically trained man. With rare exceptions all the mines are managed and operated by men who have gained their knowledge of mining in the school of experience. Recently the Creede area has been surveyed by the topographers of the United States Geological Survey and a strong effort is being made by those



Map of Southwestern Colorado.

interested in the district to secure the publication of the geologic folio.

Canyon City expects to have a new smelter. The Tri-Billion Smelting Co. has obtained concessions, and will shortly begin the construction of a large plant to handle the ores produced by its mines at Magdalena, New Mexico. With this addition to its present smelting facilities, Canyon City will rank as a smelting centre of no mean importance.—The deep drainage adit at Cripple Creek is being advanced by company men, and is now in about 300 ft. Easier drilling ground is expected soon, and meanwhile preparations to sink the intermediate shaft are being actively urged.

The drain of Nevada upon mining labor is being felt in all the camps of Colorado. Partly is this due to the higher wages obtainable in the newer camps, and partly to the roving disposition of the native-born miners, to whom the desire to see a new camp and the possibility of making a 'strike' themselves is a lure too strong to be resisted. The pay for the hours of labor is already high, but if the demand for men grows to any great extent it may force a further advance. In this connection it is worthy of passing notice that, as a rule, the wages paid for smelter and mill work are usually low, compared

with mine wages, although the work is neither less arduous nor calls for less skill, in fact, in many cases, quite the opposite is true. It seems certainly true that miners' wages are as high at present as the conditions justify.

The Colorado Sulphur Co., which is actively exploiting the sulphur deposits on Trout creek, in Mineral county, is advancing Colorado to a place among the important producers of sulphur. One of the chief sources of local demand for sulphur is in the making of sheep dip. For this use it is important that the sulphur shall be as free as possible from selenium, as the latter causes a perceptible darkening of the wool. The Mineral county deposits, which average 80% sulphur as mined, are almost absolutely free from the deleterious element, and the product is consequently in great demand among the ranchmen of southwestern Colorado.

The Cripple Creek district bids fair to stand sponsor for another industry in a mineral way. A shipment of mica was sent out from Wilbur over the Florence railroad, and this will be a test shipment for other properties in the vicinity. Fred Hackey is the gentleman who stands responsible for the new enterprise; his hopes are based on the present large demand for mica products and the extensive area of the mica belt.—A large amount of piping is being placed in the Findley mine on Bull hill, 11,000 ft. of 6-in. on this property, and about 2,200 ft. of 3-in. pipe in the Findley, Shurtloff, and Mountain Beauty properties. On the last a large orebody has been opened on the 800-ft. level and something like 3,000 tons per month is expected to be the result.—The Cresson is handicapped by bad air at the present time, but this condition is soon to be overcome by connection with a 60-ft. shaft and the 300-ft. level, which will ventilate the lower levels and various stopes as well.

The Jo Dandy mill is in operation, about 100 tons being handled daily. This is a new mill and has been running about ten days. A clean-up will be made about the first of the month, when its efficiency will be definitely established; so far the operations have been satisfactory.—Three gold bricks were consigned to the Denver mint as a result of a clean-up at the Phoenix mill of the Phoenix M. & M. Co., the bricks aggregating 160 oz., representing a ten-day run and 1,200 tons of ore of an average value of \$2.80 per ton.

The removal of buildings on the site of the new Stratton's Independence mill has been accomplished and trenching for the foundations is in full swing. The summer rains have interfered with this work. The consulting engineer, Mr. Philip Argall, is expected to arrive next week. The Stratton's Independence Co. has secured a counter injunction restraining the Portland Gold M. Co. from working along the boundary line pending the trespass litigation, consequently territory contiguous to the boundary is idle.—The railroad company is making a fill across the cave which recently occurred on the Stratton's Independence property and expects to be running trains across it in a few weeks.—The leasing system, recently started on the Ajax property, is now in operation, about 25 blocks being worked, with others to be let. The average value of the output is an ounce and between 30 and 40 carloads represent the monthly consignments.

The British American Leasing Co., operating on the Dante, has made connections through a 460-ft. shaft with the main workings of the Trail tunnel; a skip is being installed and the railroad is building a spur to facilitate loading. Regular shipments will begin in a few days from the ore already broken in the stopes, and the output is expected to be a car per day.—There is increased activity in the region about the town of Cameron, on the northern rim of the district. Eastern capital is invested, which is largely responsible in proving up the

dikes and veins that appear to be offshoots of the Bull hill system. A 3-ft. vein is being followed to its crossing with the Bull hill dike, which goes through the property of the Mayflower Gold Mg. Co., under the management of lessee S. B. Stewart. Shipping ore is expected to be found at the junction. Several other operators are energetically at work with the aid of Eastern capital on Tenderfoot hill, which in the early days produced well in workings of from 100 to 200 ft. in depth.

Mexico City.

Branch Railroad From Guanajuato.—Transfer of Mines to American Companies.—Sale of the Palmilla.—Awakening of Parral.—Real Del Monte.

At last comes the most agreeable news that the great old mining camp of Guanajuato is soon to have an all-rail connection with the outside world. The date set for the formal opening of the Mexican Central's branch into the city of Guanajuato is that of President Diaz' birthday and the Independence Day, September 15 and 16, which will be made the occasion of a great celebration,

with P11,000 each. All of these, as well as the Cubo, Guanajuato Amalgamated, Republic, Carmen, Peregrina, San Prospero, Mexico Milling & Transportation Co., Nayal, Cabrastante, and others are foreign (principally American) companies. The final payment of P100,000 recently made to the old English company, United Mexican Mines Co., Ltd., for its last holding, the San Cayetano, by the San Cayetano Mining Co., Ltd., organized by Captain W. Murdoch Wiley, places all the properties now, from La Luz vein to the city of Guanajuato, a distance of several miles, in American hands. And there is no denying that this, though good prices have been given for all at the times purchased, is a sore spot in the side of the Mexican. His great old properties, in many cases abandoned, have gone from him and by modern methods and opening of great bodies of low-grade ore, the treatment of which is now made possible, are being converted into storehouses of great wealth by the omnipresent and omnipotent gringo. Envious therefore of the latter's success, the Mexican forgets that he put a price on his mine and got it.

What bids fair to be a forerunner of grand awakening

in the Parral district is the recent deal for the famous Palmilla mine of Pedro Alvarado. The fire which occurred there several weeks ago did not prove as disastrous as was at first supposed, but it evidently had some bearing in hastening the late deal. The property has in the last few years produced from P10,000,000 to P12,000,000, and made Alvarado, the sole owner, a very wealthy man, but his great extravagance and ignorance of the value of money soon ran him into debt, and at the time of the fire he was negotiating with Bert Peterson for a lease and bond on the property. The fire caused his needs to be even more pressing. Finding that J. F. Flynn and Eugene Davis (of Washington, D. C., and the Capuzaya Co., adjoining the Palmilla) were ready to make the necessary advance, he ignored the deal with Peterson and leased to Flynn and



Mexico.

for which many thousand dollars have been raised. And well may it be the occasion for a gala day, for after that date it will no longer be necessary to take that miserable ride for miles in a more miserable mule-car in order to enter Guanajuato, which a long-suffering people have more or less patiently stood for years. Why the people of Guanajuato have not long before this demanded a railroad connection cannot be understood, but of late years the foreign interests have been growing so rapidly that they would no longer stand for the street-car company's extortions, and were preparing to build in a road of their own had not the Mexican Central hurried and made the necessary preparations for doing so. It is but another example of the fact that Mexico has to thank the foreigners for forcing development of the country. And now that the Mexican Central has constructed this branch into the city of Guanajuato, private interests are preparing to connect the railroad with all the principal properties of the camp by means of a belt line for which a concession has been obtained by George W. Bryant, one of the principal stockholders in the great Pinguico mine, or the Guanajuato Development Co. This shows in part what a great camp Guanajuato has again become, as is also emphasized by the combined payrolls, which five years ago were little more than a pittance, and now amount to over P80,000 per week, being led by the Guanajuato Reduction & Mines Co. with P15,000, and the Guanajuato Consolidated M. & M. Co. and the Pinguico

Davis the Palmilla mine for a period of 15 years, at 45% royalty and P600,000 cash (P200,000 down and P400,000 in three months) to be deducted from the royalties. Flynn and Davis are already in charge and in a couple of weeks have unwatered the lower workings, which Alvarado, with an array of pumps and natives, has been unable to do in over a year. The transfer of this magnificent property by foreigners will undoubtedly be followed by many changes. The electric plant will be hastened to completion, and there is little doubt but what a mill and cyanide plant will soon follow. Both Mr. Flynn and Mr. Davis are among the most progressive men in Parral, having been operating in the camp for years.

The United States Mining, Smelting & Refining Co., is making many improvements to its Real del Monte property, near Pachuca. The old works are being transformed into modern plants and electricity is being applied in their operation. The old reduction works using the patio process have been converted into a cyanide plant, with 40 stamps and more than 10 Chilean mills. The capacity of this plant is 250 tons daily. Another cyanide mill is being built by the company. It will also have a capacity of 250 tons. The electric power for operating the machinery of the mines and mills will be obtained from the Compania Electrica e Irrigadora de Hidalgo. The amount of power required is 5,000 hp. The Real del Monte mines have been constantly worked since 1523,

when their exploitation was begun by the Spaniards. The Oxman Prospecting Co. is installing a 10-stamp mill at its mines near Guzapares, in Chihuahua. It is expected that the increase of production will soon require the establishment of an additional 10 stamps. Other machinery is also being installed at the mines. Frank Holmes is manager.

The Cabrillas company is doing a large amount of development work upon its mines in the Monterey district. A large body of rich ore was recently struck in the Santa Brigeda mine. Ore shipments are also being made from the Paloa mine, which is another one of the company's promising properties.

La Compania Minera de la Guadalupe has been organized for the purpose of operating the ancient Spanish mine of La Guadalupe, near Santa Engracia, in Tamaulipas. This mine was operated profitably many years ago, but was shut down when the price of copper got low. It is claimed that it contains a great body of copper ore that can now be worked profitably. The ore will have to be hauled by wagon 14 miles.

The Cambio Gold Mining Co. is installing a 30-ton reduction plant in the Rosamorado district, in Tepic. This company is composed of Cincinnati men. It owns several ancient mines and a large tract of mineral land that has not yet been explored. The development work has been in progress for two years and a large amount of low-grade ore is in sight. John A. Bender is general manager.

Butte, Montana.

July Production.—The Fire in the Minnie Healy.—Strike in the Lizzie. The Farrell Copper Co.—Sinking on the Nipper.—Development of the Parrot.

In July the Butte mines produced 27,157,395 lb. copper from about 413,385 ton of ore, an average daily output of 13,335 tons of ore and 876,045 lb. copper. Although the Minnie Healy mine of the Butte Coalition Co. and the West Colusa of the Boston & Montana Co. were closed for several weeks during the month on account of the fire, the total output of the district was not affected, as other mines made up the loss occasioned by the shut-down of the two properties. The strike of ore-haulers having been settled, a number of the smaller mines resumed operations during the latter part of the month, including the Gallatin and J. I. C. of the Anaconda.

The average production of the different companies during the month was as follows:

Company.	Tons of ore.	Pounds of copper.
Boston & Montana.....	104,160	7,082,880
Anaconda.....	124,000	7,564,000
Butte & Boston.....	20,150	1,229,150
Washoe.....	10,850	651,000
Parrot.....	11,470	642,320
Trenton.....	12,710	762,600
North Butte.....	38,440	3,113,640
Coalition.....	44,950	3,011,650
Original.....	25,730	1,569,530
East Butte.....	7,750	589,000
Pittsburgh & Montana.....	9,300	651,000
Miscellaneous.....	3,875	290,625
Total.....	413,385	27,157,395

The astonishing story published by a Boston financial paper that there was a fire "raging" in the Minnie Healey, and that it was believed that the ore-shoot on which the Minnie Healey, West Colusa, and Leonard mines were mining was the crater of an extinct volcano, "and that the effects of the fire may prove more serious than the outside world has dreamed of," had the effect of creating a lot of indignation among officials of the Butte Coalition and the Boston & Montana companies, as well as among local business men generally. The inference

that an old volcano was furnishing the fire in the Minnie Healey is the purest sort of invention. At no time has the fire in the mine been "raging," and it has never reached the orebodies. The fire has for a long time been smoldering in the fillings of old stopes between the 600 and 700-ft. levels, and there is no fire below that point. While the men were driven out of the mine for a few days the fire made its way down to some of the lower levels, but that was insignificant and was quickly put out as soon as the air currents were changed and the gas was driven out of the mine. It was only recently that the exact position of the smoldering fire was ascertained, and now it will soon be absolutely confined and controlled. The former owners of the Minnie Healey filled some of the old stopes hurriedly and carelessly during the Heinze-Amalgamated underground warfare, and it is believed that the fire started in some of this old filling, composed of all sorts of trash sent down from the surface, including manure and hot ashes. "The fire in the Minnie Healey," said J. C. Adams, superintendent of the Boston & Montana mines, "is no more serious than that which has existed in the Anaconda mine for years. By systematic means we are overcoming it, and it will be only a short time before the three properties are in full operation again. In order to expel the smoke and gas from the mines we have commenced sinking an air shaft on the Minnie Healey, in the centre of the orebody, and this is going down at the rate of six feet per day. It is now down 500 ft., and will have to be sunk to a depth of 600 or 700 ft. before it can be used as an upcast to carry off the gases. This will take three or four weeks, but when completed all the gases will be brought to the surface, and it will be impossible for them to spread to the other connecting mines." Holes have been drilled into the fire zone and water is being poured through them, and it is only a question of a few weeks when the fire will be entirely extinguished. In spite of the shut-down of the mines, the Boston & Montana smelter at Great Falls has been running at full capacity, the Mountain View, Pennsylvania, Leonard, and East Colusa mines producing more ore than the Great Falls plant can treat.

Lessees working on the Lizzie claim, one of the Davis-Daly properties in the heart of the city of Butte, made an important strike of a copper vein at a depth of 100 ft. At that depth the vein has several feet of first-class ore and possesses all the characteristics of the profitable veins of the district. There have been stories published of other strikes in the Davis-Daly ground, but most of them are unfounded. One big vein has been cut in the Thomas claim by the long cross-cut from the 1,800-ft. station of the Original mine, but the ore is not high-grade. No other important veins south of the Thomas have been cut.

L. W. Harriman, one of the Minnesota farmers who became interested in Butte copper when the excitement was high, has purchased an eighteenth interest in the property of the Baltimore Mining Co., situated about three miles from Boulder, in Jefferson county, paying \$10,000 for it. A number of Butte men are interested in the property.—The troubles of the Milwaukee Gold Extraction Co. were supposed to have been settled when George H. Savage resigned as superintendent, but Savage has now brought suit for \$40,900 salary alleged to be due him, and has attached all the property of the company in the Red Lion mining district of Granite county, including the cyanide plant.—Some very encouraging developments have been made by the Farrell Copper Mining Co. during the past month. About 10 days ago a cross-cut from the 200-ft. level of the Alliance shaft passed through a well defined 7-ft. vein, 30 in. of which is good ore. It is not commercial in the cross-cut, however, but is merely considered as an indication of what may be expected with

further development. A drift has been run along the vein for about 20 ft. Considerable water was encountered upon cutting the vein, and the flow was so great that work had to be stopped until provision could be made for handling it. The company is considering plans for more extensive development of the property. The Alliance Co. has proved the mineral value of the ground adjoining the Farrell, and the belief is strong that the latter will develop into a good producing property.

The Butte Coalition Co. has temporarily suspended mining on the Nipper vein, which had been carried on through the shaft of the Parrot mine. There is much water in the old workings of the Nipper mine and there was growing danger that it would be tapped and let into the Parrot. A raise was being made from the 1,200-ft. level of the Parrot to the 1,000-ft. level of the Nipper when work was ordered stopped. The water in the Nipper is about 300 ft. deep, and as soon as some arrangement is made for handling it, work will be resumed.

Houghton, Michigan.

Concrete Work in Hancock Shaft.—Satisfactory Developments.—Keweenaw Copper Co.—Rich Ore Uncovered.—Concrete Shaft of the Bangor Mine.—Method of Sinking.

The concrete work which has been under way for the past three weeks at the Hancock Consolidated No. 2 shaft was completed last week. The concrete extends from the surface down to a depth of 30 ft. At its lowest point it is four feet thick; from there to the surface there are numerous steps decreasing the thickness to two feet at the collar of the shaft. Very little overburden was encountered at the No. 2 shaft and it was necessary to penetrate but five feet to reach the bedrock. This, together with the fact that the concrete was carried down 30 ft., insures an exceedingly strong construction at the collar of this vertical opening. The concrete, while filling and reinforcing the sides of the shaft, is also interlaced horizontally and vertically with old rails and heavy



The Copper Region of Lake Superior.

Each rectangle is a township, six miles square.

Key to Mines.

- | | |
|---------------------|-------------------|
| 1. Etna | 19. Tamarack |
| 2. Empire | 20. Osceola |
| 3. Delaware | 21. Tecumseh |
| 4. Amygdaloid | 22. Rhode Island |
| 5. Copper Falls | 23. Franklin, Jr. |
| 6. Central | 24. Franklin |
| 7. Phoenix | 25. Arcadian |
| 8. Cliff | 26. Quincy |
| 9. Mohawk | 27. Isle Royale |
| 10. Ahmeek | 28. Atlantic |
| 11. Allouez | 29. Baltic |
| 12. N. Kearsarge | 30. Trimountain |
| 13. Wolverine | 31. Champion |
| 14. Mayflower | 32. Belt |
| 15. Centennial | 33. Adventure |
| 16. Tamarack Jr | 34. Mass |
| 17. S. Kearsarge | 35. Michigan |
| 18. Calumet & Hecla | 36. Victoria |
| | 37. Winona |

The company had been mining about 75 tons of ore per day from the Nipper.—The new vein cut at a depth of 2,100 ft. in the Corra mine is being opened by the Coalition company and is developing into a splendid orebody that may make the Corra one of the most important mines owned by this company.

The Parrot company is doing development work in both the Parrot and Little Mina mines. The intention is to open the Parrot vein at a greater depth and also to cross-cut for the Never Sweat vein of the Anaconda, which dips into a portion of the Parrot ground. This vein is a large one and has produced an immense amount of high-grade ore.—The two veins that have been cross-cut on the 2,200-ft. level of the Anaconda mine are being opened by drifts and raises, and work on the cross-cut on the 2,100-ft. level is being slowly extended south toward the second vein, known as the south vein, because its apex is south of the shaft. The first vein has its apex north of the shaft, but at the 2,400-ft. level it is 500 ft. south of the shaft. The second vein is about 1,300 ft. further south at that depth and will not be reached for some time yet. It is not likely that any ore will be mined from this level in a year, and sinking in the Anaconda shaft has been suspended.

A 25-drill air-compressor is being installed by the Pittsburg & Montana Co. The compressor will furnish power for the lower levels of the mine, which are 1,100 feet deep, and will enable the company to mine and prosecute development work on a more extensive scale.

bands. Steel channel-beams are used as dividers between the compartments. The No. 2 shaft has now reached a depth of 240 ft. It has inside dimensions of 9 by 30 ft., containing five compartments, four for skip roads and one for ladders and piping.

The shaft will be sunk to a distance of 3,600 ft., when it is anticipated it will cut the Quincy vein. As yet the ground through which this shaft will pass has never been explored. Numerous other veins will be intercepted at various depths, among them the Hancock west conglomerate, Hancock amygdaloid, and Pewabic west conglomerate. Satisfactory progress is being made in the mining operations at the old No. 1 shaft. Good ore is being hoisted and a stock pile is rapidly accumulating. Underground development is proceeding with favorable results. Seven drills are now in operation, one in sinking and the other six in the lateral openings. The shaft is 20 ft. below the eleventh level or a total depth of 1,050 feet.

The development work at the Keweenaw Copper Co.'s property is progressing rapidly. The showing is most gratifying. About 2,000 ft. west from the Medora shaft the company is diamond-drilling for the purpose of ascertaining the outcrop. When this is determined it is proposed to sink another two-compartment shaft. The diamond-drill will probably cut the lode before the month is over and as soon as it does the new shaft will be started. It was the original intention to start a new shaft on the Empire tract, about three miles from the Medora shaft, but owing to the inability to secure men for the

work the idea was abandoned. Had a new shaft been started at the Empire it would be necessary for the Keweenaw to secure an entire new equipment, but at the point where work is now to be started this is unnecessary. The Medora shaft is now in rock which is believed to be the richest ever encountered in any mine in the Lake Superior region. Expert mining men who have visited the underground workings of the mine during the past month are surprised at the rich showing. The ground is heavily shot with copper, making it an ideal stamp-rock. At present there are 10 drills working in this shaft and a total of 1,700 ft. of drifts have been done. The lode averages 12 ft. The shaft is close to 700 ft. in depth; a station has been cut and the 675-ft. main level is started. At the 600-ft. sub-level the lode was reached by a cross-cut and found highly mineralized. The management intends to continue driving and sinking as rapidly as possible.

Toronto, Canada.

The American Institute.—Larder Lake.—The Strike at Cobalt.—Shipments of Ore.—A Discovery Near Elk Lake.

The visit of the members of the American Institute of Mining Engineers to Cobalt occupied about three days, during which the party inspected the principal working mines. Many of them expressed unreservedly their surprise at the richness of the orebodies in sight and admitted that they had previously been skeptical as to the status of the camp. The party also spent two days at Lake Temagami and neighborhood and before returning visited the Sudbury nickel mines and the newly opened iron deposit at Moose mountain. They were enthusiastically received and lavishly entertained at every point.

Larder Lake is profiting by the miners' strike at Cobalt, many of the strikers having found work there. Several new discoveries are reported, including a find on the properties of the Gold Horseshoe & Larder Lake Co., where a band of quartzite 60 ft. wide and extending over three claims has been found, apparently carrying good gold ore. Another find has been made on a claim of the Towinine company. Prospectors and companies are busy doing assessment work to hold their claims, the regulations requiring that 30 days' work must be done within 90 days after registration. As this has been impossible in many cases, owing to the backwardness of the season, bad roads, and the pest of black flies, the Government has extended the time within which this must be done to September 30. Many claims are offered for sale very cheap, the reason being that the holders find development work too costly for their resources, and consequently have to sell for what they can get.

At Cobalt, many of the companies that have refused to concede the demands of the union are working with reduced forces, while others have closed down their mines, among the latter being the Drummond, University, and Silver Leaf. Some new men are arriving and the places of the strikers are being gradually filled. The Nipissing has 300 men at work.—Ore shipments for the week ending July 27 were 281 tons, the following being the shipping mines: Buffalo, 30 tons; Coniagas, 156; Hudson Bay, 22; La Rose, 40; Nipissing, 30; Tretthewey, 25. An important find is reported at the Foster, where 80 men are working. A new orebody has been struck which is said to assay \$15,000 per ton.—A fine sample of ore of about 30 lb. has been forwarded to Toronto from one of the locations of James Gifford in James township, a short distance from Elk lake. It resembles Cobalt ore in all essentials. Contracts have been let for the sinking of a 50-ft. shaft on the Elk Lake Mining Co.'s location.

Salt Lake, Utah.

Slime Plant at Mercur.—Utah Copper.—Ohio Concentrator.—Tintic Smelting Co.—Strike at Tintic.—Shipments From Park City.

The operation of the new slime plant, erected by the Consolidated Mercur Gold Mines Co. at a cost of \$25,000, has been demonstrated a success and the management has announced that the capacity will be increased from 400 to 600 tons of ore per day. John Dern, the president, states that by reason of the operation of the plant it will be possible to make an additional profit of 50c. per ton on the ore treated and that the value in the tailing will be reduced to about 45c. per ton.—The fifth section of the Utah Copper Co.'s mill at Garfield will be started next week, when the plant will be giving treatment to 2,500 tons of ore daily from the mine at Bingham. The sixth section will be in operation before September 1. At the mine, the company has five steam-shovels in operation, some of them being used to strip the surface overburden from the orebodies while the others are working on ore to supply the mills at Garfield and Copperton.

The Ohio Copper Co. is making satisfactory headway with the construction of its concentrating mill near the Dalton & Lake mine at Bingham. The steel structural material is being put in place and contractors expect to have the building completed before the end of September. The management hopes to have the plant ready for operation in November. The initial unit is being built to handle 2,000 tons of ore daily, and it is expected that the capacity will be doubled in 1908. The Ohio mine has developed into one of the big mines of Bingham. The company's engineers claim that there are 7,000,000 tons of ore averaging between 2 and 3% copper actually blocked out. The concentrate from the mill operated by the Ohio company at the present time contains from 20 to 22% copper, with additional value in silver and gold.—The Tintic Smelting Co., organized less than a year ago, is pushing the construction of its smelter near Silver City, in Juab county, for the treatment of gold-silver-lead ores. The foundations for the plant are practically completed, and the structural material and equipment is arriving. This enterprise is being promoted by a strong syndicate of Utah mining operators. It is expected that the smelter will be ready early in 1908.

What is considered to be the most important strike ever made in the Eagle & Blue Bell mine in the Tintic district has been confirmed. An orebody was encountered at a point 600 ft. north from the shaft in a portion of the mine heretofore unprospected. The shoot has been opened 50 ft. each way, with the actual dimensions to be determined. The ore is rich in silver; assays as high as 700 oz. having been obtained. The casing to the ore deposit carries copper ore 40 to 60% and is from 12 to 18 in. thick. The Eagle & Blue Bell is controlled by the Bingham Consolidated Mining & Smelting Co.—A controlling interest in the American Mining Co., at Tintic, has passed to Jesse Knight, of Provo, and the deal is to be ratified by shareholders next week.

The Treasure Hill mine at Park City has changed management. It is now controlled by Salt Lake and Provo mining men, who have also acquired the Kentuck group. The Treasure Hill Coalition Mines Co. has been organized to take over both mines, and an option has been secured on the Creole, an adjoining property. Extensive development will be undertaken at once.—The output of ore from Park City mines during July aggregated 8,637 tons.—The ore shipments last week from Park City mines amounted to 1,308 tons, the contributing mines and respective amounts being: Silver King, 748; Daly-Judge, 368; Daly, 85; Little Bell, 65; other mines, 42 tons.

Johannesburg, Transvaal.

Repatriation of Chinese.—Hot Debate at Pretoria.—Situation Accepted in Good Spirit.—Insufficient Kaffir Labor.—Poor Outlook.

"Well, what do you think of the repatriation of the Chinese?" is the question that almost every man has asked his neighbor during the past fortnight. Could all the replies to that question be put down in a book there would be a collection of extraordinary variety. Those people who know least about the working of the mines, and unfortunately the Government now in power heads this list, are jubilant over the prospect of seeing the last of the Celestial on the Rand. As a matter of fact, there is not a single member of the Boer Government who is a practical mining man, and who knows at first hand the needs of the industry. Their knowledge is purely academic.

The Progressives, who represent the mining industry, put up a splendid fight in Pretoria, during the debate on the Chinese question. Sir George Farrar, the leader of the Opposition, who was referred to by General Botha as the father of Chinese labor in the Transvaal, attacked the Government's policy in a vigorous speech. He defended the introduction of Chinese labor, and showed how much the Transvaal gold output has advanced since their advent. He made a strong plea for their retention, for the time being at least, and solemnly warned the Government that the gloomy times we are now passing through would be made ten times worse by the enforced departure of 17,000 skilled Chinese this year. The Opposition bombarded the Government position with the accusation that they had bargained with the Liberal Government in England to get rid of the Chinese, in consideration of a £5,000,000 loan for the Transvaal, which the Imperial Government has guaranteed, to be spent on the Boer farms. But in spite of the pleadings and threats of the opposition, the Government decided against the retention of Chinese. Already 500 coolies have left the Rand for China, their time having expired. In their original contract the coolies are allowed to re-engage for three years, but the Government would not allow one to sign on again.

There are people who still maintain that the fate of the Chinese is not sealed; that although 17,000 will be sent away this year, the Government will not let the balance go next year. This is mere foolishness. The Chinese will go, no matter what happens. The Boers are so firmly in power that they can afford to forget their election pledge of doing nothing to harm the mining industry. They are wise enough to see that they will gain most by sending the coolies out of the country. Their policy is to please their masters, the Liberal Party, who placed them in power, and who will keep them there so long as they stand pat on the Chinese question. And so, two parties, the Liberals in England and the Boers in this country, have played with the gold mining industry to gain their ends!

The Rand has been forced to start afresh on several occasions, and now she begins yet another chapter. It might be of interest to inquire what are the chances of success under the new conditions, and whether there will be an expansion or contraction in the future. In the first place, it is a pleasure to state that the leaders of the industry have accepted the decision of the Government in the finest spirit imaginable. While they are bitterly disappointed that their efforts at reducing working costs, so as to make the field of operations on the Rand as large as possible, have been completely upset by the removal of Chinese, the leaders are not inclined to skulk in their tents, but have come out manfully and declared their intentions of doing the best possible under the new

conditions. Almost every mining man of note predicts that the cost of production will increase when the Chinese go. The Government justifies its action by declaring that there are sufficient Kaffirs in the country to supply the mining industry. This is all bunkum. At the present time there might be sufficient labor, but the Kaffirs will not serve steadily, and it is the firm belief of those who know the labor conditions best, that there will not be a sufficient supply of colored labor to allow of expansion. Unfortunately the competition for Kaffirs will become so keen all over South Africa that the wages for black men will increase every year. We will revert to the same conditions as held just after the war. The writer has seen a Kaffir surrounded by four gentlemen greatly in need of a servant, all offering the black man work. The Kaffir asked the first man how much a month he could offer, and received the reply £3. This black man allowed the competitors to bid for his services, and although the last offer was £6 per month, an extremely high wage for a native servant, his highness the Kaffir said he would not work for £20 per month, as he had saved up sufficient to keep him for years.



Map of South Africa.

To keep the mines running it will be necessary to use an increasing supply of white labor, if it can be obtained. The Afrikanders will no doubt be attracted to the mines in large numbers, but unfortunately the mines cannot afford to pay more than 5s. per day to rough laborers, and it is feared the white men will not work very long for this wage. Then again the prices for skilled underground men have been so reduced since the strike that it is probable that the Rand will not attract skilled miners from overseas. Why, for instance, should a miner come here from America, when he can earn the same money in the States? Given the same pay, America will prove more attractive to the average Cornish miner than South Africa. It is now recognized that the Rand will be forced to find not only rough laborers like Kaffirs, but will also have to educate from the white men of the country, artisans and supervisors. At the present time there are a large number of men being taught mining. About half of the applicants are failures, and will never make good underground workers, but it is hoped that by persevering these underground schools will in time be able to turn out efficient miners.

Looking forward is trying to the stoutest-hearted optimism. Even under the unfavorable conditions the Rand will keep going, but it is the opinion of the writer that there cannot be any great expansion. The zenith of the Rand is past as soon as the supply of unskilled laborers is uncertain, that is, when the Chinese leave.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

BLISTER STEEL is steel made by carburizing wrought iron by heating it in contact with carbonaceous matter. It might also be made by so carburizing a low-carbon steel.

DURING the first six months of 1907 the dividends paid by the gold mines of Bendigo amounted to £50,504, while the calls or assessments were £119,894. The total of gold produced was 93,788 ounces.

TOPAZ usually occurs in gneiss or granite, with tourmaline, mica, and beryl, and often contains inclusions of liquid carbon dioxide. It crystallizes in the orthorhombic system, has a highly perfect basal cleavage, and is found altered to steatite and kaolin.

CONSIDERABLE QUANTITIES of turquoise have been taken out from the mines in the desert region of San Bernardino county, including many stones of large size, which range from 50 to several hundred carats. Some of the latter have sold as high as \$1,500 each. The color is mostly a pale shade, and large quantities have been sold.

PHOSPHORUS unites with iron in all proportions up to 26%. In pig iron it causes brittleness, especially when the metal is subjected to shock-like strains, but gives fluidity to the metal while casting, and tends to prevent blow-holes. Phosphorus lowers the point of saturation of iron for carbon, and in consequence phosphoric iron is always low in carbon; it can not be removed from iron in the blast-furnace.

THE world's supply of cadmium is chiefly derived from Silesia, where zinc smelters obtain it as a by-product. The metal is sold in little bars guaranteed to contain 99.5% pure cadmium. At beginning of 1906 the price was 725 marks per 100 kg., then, owing to demand, it rose to 1,500 marks in May of the same year. Since then quotations have fluctuated from 1,200 to 1,300, and recently, large quantities being required, prices further augmented to 1,250 and 1,325, according to amount and distance of journey.

THE metric system of weights and measures was legalized in the United States in 1866, and an international bureau of weights and measures was established near Paris in 1875 by concurrent action of the principal governments of the world. Under the direction of a committee, two ingots of pure platinum-iridium were cast in the proportion of nine parts to one part, and from one of these a number of kilograms were prepared, and from the other a number of metre bars, which were compared and one of each was chosen as the international prototype standard.

MOLYBDENUM is largely used for the same purposes as tungsten; but in addition thereto it enjoys many and varied applications in the chemical and ceramic industries, but the quantities used in others than the metallurgical line are but small. Although it is authoritatively stated that the action of molybdenum in steel is from two to three times as powerful as that of tungsten, technical difficulties have opposed themselves to the production of pure compounds at less costs; but as soon as a constant and reliable supply of the raw material shall be insured, these difficulties will be overcome. Molybdenum will then have a much wider range of application, inas-

much as it is already used advantageously for improving the steel for rifle barrels, for large guns, for propeller-shaft forgings, and also for wire drawing, as, if a certain proportion is added to the steel, this increases its elongation and improves its flexibility. Moreover, the manufacture of molybdenum steel is less complicated than that of tungsten steel, and as soon as a regular production of molybdenum ores can be relied upon the metal will become of great importance.

THE effects produced by electrostatic stresses are much more marked in the case of solid than in liquid or gaseous dielectrics, owing to the fact that chemically the former are more complex and structurally are less homogeneous than the latter. Conduction, as in the case of gaseous and liquid dielectrics, is due to the motion of ions, and varies with the applied voltage much in the same way as on these materials. With weak fields the resistance for given conditions is constant over a certain range in voltage. Its value, however, varies considerably, according to the temperature and hygroscopic condition of the material.

IN most masonry specifications is found a clause specifying that the sand for mortar or concrete shall be clean. But the results of tests of mortar to which large portions of loam or clay have been added have often been higher than those of mortar made with cement and pure sand. It is believed to be impossible to make a general statement in this regard, as in some cases it is a benefit and in others a detriment, depending upon the richness of the mortar and the coarseness of the sand. Lean mortars may be improved by the presence of loam or clay or the use of dirty for clean sand, because the fine material increases the density.

A CORPORATION may be formed for the purpose of acquiring and operating mines. At the outset it has no property. It is supposed to acquire it by purchase out of its capital. If it does not so acquire it, however, it commits no offense. If, however, its organizers or promoters falsely represent to the public or individual investors as an inducement to them to purchase shares of stock, that the company has acquired a given property when in fact it has not, they are guilty of obtaining money under false pretenses, and the District Attorney of the county where the false representations were made, would be the official to take charge of the prosecutions. If the United States mails are used in the effort to promote 'fake' mining schemes, another crime is committed of which the Federal officers could take cognizance.

GRAPHITE sometimes occurs in six-sided tabular crystals of the rhombohedral system, but commonly is found in imbedded foliated masses, often scaly, slaty, or earthy. It has a perfect basal cleavage, and breaks into thin laminae that are flexible, but inelastic. The purest forms usually yield a little ash upon combustion. The specific gravity varies with the amount of impurities, but is about 2.2. It occurs in beds and embedded masses, laminae, or scales, in granite, gneiss, mica-schist, and crystalline limestone, and is in some places a result of the alteration by heat of the coal of the coal formation. It is sometimes found in basaltic rocks, as with the metallic iron in Greenland. In the United States, the mines of Ticonderoga, on Lake George, have furnished much of the graphite, and some is mined in the Huronian slates of northern Michigan. A deposit was at one time worked at Sonora, Tuolumne county, California, and it occurs in Alpine, Kern, Los Angeles, and Fresno counties.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

Leachable.

The Editor :

Sir—I notice in a recent article by Mr. F. L. Bosqui that he refers to that portion of the crushed ore which may be successfully treated by percolation in cyaniding as the “leachable” ore. So far as I can judge from the Century Dictionary, this is a correct use of the word, but it seems to me there should be a distinction between an ore from which the value may be removed on account of the soluble condition of the precious metal, and an ore through which solutions will pass on account of the physical condition of the particles. In other words, I should say that a mixture of sand and sugar was *leachable* because the sugar would dissolve, but that it was *percolatable* because the particles of sand were in such a physical condition that the solutions would pass between them. Is there any other way of distinguishing this?

FUSSY.

[Why not say ‘pervious’? Would not that express the physical condition indicated? ‘Percolatable’ won’t do; ‘percolable’ would be correct, but awkward. Try pervious or permeable.—EDITOR.]

Mining Schools and Their Graduates.

The Editor :

Sir—Your issue of April 27 contained a short editorial concerning the inaccuracy of college publications “in reference to appointments obtained by alumni.” This brought forth a letter from ‘One of Them,’ which appeared in your issue for May 25, in which he discusses the influence of these statements on a boy about to make a choice of a profession, the actual (?) discrepancy between the statement and the real job, and what a graduate should expect when he gets out of college. There is so much that is good, and true, in this letter that I hesitate to criticize even that portion which seems to me exaggerated, or misleading, especially as my acquaintance with college publications is quite limited. It seems to me, however, that he must refer rather to the publications of the State institutions such as he mentions than to those of the standard colleges, which we may perhaps consider of a higher class, and most of which are to be found in the Eastern States. The State School of mines, or the University, which is maintained by a State, is unfortunately in many cases a political football, the trustees and the president, sometimes even the professors, being changed when a new party or faction comes into power. The average Western legislator is not, and cannot be expected to be, up to the standard of the carefully selected board of trustees or overseers of the older institutions. Accordingly, in order to obtain the funds necessary for salaries, buildings, equipment, and libraries, it is necessary to impress the Legislature with the large number of students that is being prepared for future professional work, with the prominence which they are attaining after leaving the school, and, consequently, the credit which is being reflected upon the State. At any rate it is undoubtedly much easier to obtain funds by doing this than it is to try to educate the legislator up to a broader standard. For this reason I imagine that the statement made in the editorial, and elaborated by ‘One of Them,’ may be true of certain institutions. I do not, however, think that it is fair that all college publications should be included in this category. One of the instances which I presume ‘One of Them’ would consider as giving an exaggerated

idea of the possibilities of the mining profession to the student has recently come to my attention. I first saw it in a daily paper wherein it was stated in an editorial that “There never was a time when the entirely competent educated man was surer of handsome reward in business.” As an instance it went on to say that statistics of graduates of the Lawrence Scientific School “Show that Harvard’s recent graduates who have become mining engineers, although averaging only twenty-seven years in age, earned last year, on an average, \$2,390.” Further investigation showed the following conditions, as published in the Harvard *Bulletin* for June 12. The department was established in 1895, the first man being graduated in 1897. An investigation was undertaken by writing personal letters to each man who had been out of college at least one year, that is to say, graduates of all classes down to 1905 inclusive. The total number considered was 39 men, of whom 5 never engaged in mining work. Of the remaining 34, 26 had been heard from when the article was published. The occupations of these men are given as follows:

Mine superintendent	11
Mining engineer.....	6
Examining engineer.....	3
Mining geologist.....	2
Metallurgist	2
Teacher of metallurgy.....	1
Metallurgical supplies.....	1

The earnings of the men reported are:

Average for the first year after graduation.....	\$ 958
General average for the current year.....	2,390

The *Bulletin* goes on to state: “When it is considered that the average age of the men is about twenty-seven years (the oldest being not yet thirty-four), and that they have been at work on the average only a little more than four years, it must be admitted they have done well. Probably decidedly better than the average young doctor or lawyer.”

The number reported is about 76% of those who have followed mining, or 66% of the whole number graduated. Of the remaining eight it is stated that “One is reported to be very successful, and two others are believed to have done as well as the average.” Of course the men who are failures, or who are unfortunate, are those who do not reply to letters asking for information, but I believe that it might be reasonably assumed that the average salary for the first year is about \$900 for all graduates. ‘One of Them’ thinks that the effect of statements of this kind is to make the less fortunate graduate “dissatisfied and to discourage him by making him feel he has dropped behind.” On the contrary, if he has the right stuff in him it ought to make him hustle harder himself, unless he really doubts the truth of such statements, and ordinarily the graduates of an institution keep some track of each other by letter-writing during the first year or two after they are out.

If misleading reports are published, the graduate, and not the college editors, should be blamed, for this information is commonly obtained on blanks sent out annually to each graduate. It is manifestly not feasible for the editors to verify the returns made by each graduate. If, however, these replies are not strictly accurate it is a serious reflection on the college, for it has evidently failed in inculcating that regard for absolute truth which is the first professional requisite.

It seems to me that the instances of “reported and actual status,” given by ‘One of Them,’ sound very much as though he were approaching the same exaggerative tendency which he complains is shown by the college authorities; at least I have not happened to meet any such instances in many years and many miles of wandering. There are undoubtedly many misfits in the case of students who

study mining, as there are in other lines, but it has been my experience that the men who do not follow mining either send no returns, are put down as in 'business,' or give their actual occupation. That a man who has studied mining does not practice it, is no disgrace either to himself or to the college where he has studied it, and if he finds himself better suited for selling stocks and bonds, or for farming, or for running a railroad, the methodical habits which should be taught in every technical school should yet be of advantage to him. General Francis A. Walker once stated that several of our ablest railroad engineers had been graduated from the mining department of the colleges. Nor is this strange, for what broader technical training can a man receive than that which is necessary to the mining engineer, who is supposed to be a thorough chemist, metallurgist, electrician, machinist, and surveyor.

Does not 'One of Them' look a little too strongly at the dollars and cents side of the question? Certainly it is no reproach to be a successful assayer at \$75 per month if the Hungarian in the camp *does* get \$90. That a man when he gets out has an opportunity to learn the practical side of mining, by being associated in any position from mucker up, should be enough. I think 'One of Them' is correct in his view that the man who started mucking is generally better prepared to fill a position in authority than the man who started assaying, and I think the tendency now is to encourage the college graduate to begin underground. Yet there is a limit to this, and some technical papers, which have been advising the students to put in time sharpening drills, building tanks, running jigs, laying track, framing timber and putting it in, pounding a drill, and cranking a machine, apparently think the years of Mathuselah are ours. No man has a better opportunity than the assayer, if he so desires, to become thoroughly acquainted with the business side of the proposition. If, in addition to "his mechanical routine of 40 or 50 muffle-fusions," he notes the variation in values and in saving, and spends his spare time talking with the mine foreman, the mill foreman, the amalgamator, the bookkeeper, and others higher up, so far as possible, he can learn much more about the production of dividends than can the man who has spent all of his time earning the practical side of the underground part.

The point to which I especially objected in the letter referred to, is the very pessimistic view of the opportunities now open to the young graduate. From what I have seen of conditions during the past year, it unfortunately is not necessary for the present graduate 'to start at the bottom.' It would be much better for him if it were, but I am assured, by the older men at the head of those educational institutions whom I happen to know, that there has never been such a demand for the college graduate as there is today. I know, personally, that I tried to get a graduate of the 1906 class in Technology to make himself generally useful, at a salary of \$75 per month and board, about a small property with which I was connected a year ago. The only man who would consider it at all finally declined it because he thought he would get more experience with a larger company, which had also offered him a position. Last May, eleven months later, I found him in one of our larger mining districts as assistant to the manager, and practically in actual charge of mills treating 800 tons of ore per day. It probably would have been better for him could he have had the experience of a year or two at the bottom, but the indications are that he will 'make good' where he is. Good men are scarce, and men to fill responsible positions are sought from among those who have had a technical education more today than ever before. I am told that all of the men of this year's class at the Massachusetts Institute of Tech-

nology who are willing to accept positions are already at work, and that the average salary is probably in the vicinity of \$75 per month. These men are continually impressed with the fact that "the technical school cannot make an engineer; it can only give the opportunity for the young man to acquire a training which will make him first of all a man, and further to acquire a familiarity with the fundamental principles of science, which he ought to know in order to be an intelligent engineer."* They understand, as stated, that "they are going to a practical school on another man's money." But that the other man is not of the opinion that they are "for the first two or three years—of little value to any one" is evidenced by his willingness to 'put up.'

So I hope that no coming student may be deterred by the letter of 'One of Them.' It leaves unmentioned the pleasures and possibilities, the acquaintance with Nature, the actual production of real wealth, and the hosts of good fellows in the profession. Work is necessary for the achievement of success in any line, but there is plenty of room for the intelligent worker in mining, and the field is broadening.

GEO. A. PACKARD.

Boston, July 18.

A Fundamental Problem.

The Editor:

Sir—Your editorial on this subject certainly does not make a favorable case for the engineers. While dilating quite properly on the uncertainties of mining (wherein much of the charm lies) your article would tend to give a feeling of hopelessness to those unfamiliar with systematic mining whereby the element of risk is materially reduced and sometimes practically eliminated.

In gold dredging it is largely a question of the amount of money that it is advisable to spend in prospecting that determines the degree of accuracy with which a calculation can be made of the profits to be won. It is practicable to make such a calculation with more certainty than in many other forms of industrial enterprise. Manifestly if the investigation has arrived at a point where it is no longer doubtful that the property is worth the price asked, further prospecting to determine the value within narrow limits may be inadvisable as an unnecessary expense. Particular circumstances determine this question. If doubts remain there is nothing to do but proceed until they are removed.

I fully agree with you concerning the complaint that engineers often fail to be explicit. Clients need and should have specific advice. Shall they go in or stay out? If in, shall they stop or proceed, and how; in general, what shall be their next move? Beautifully written reports going into full details as to ore reserves and other engineering matters may be of little real value if leading questions such as the above are not freely and explicitly answered. On the other hand, advice without detailed information as to facts even from engineers of established reputation, is never so convincing as where the basis for deductions is made clear. Actual experience in mine management is valuable, but men who have spent years in the successful management of large properties are sometimes entirely unfitted to advise in the case of prospects or partially developed mines. Emphasis must be laid on the question of general experience. A man thoroughly conversant with conditions in one district may be at a loss in another, or unable to approach the particular problem with an open mind. It would seem that the field to choose from is somewhat limited if engineers who at some time have been retained by wellknown operators are compromised by such engagements. We have

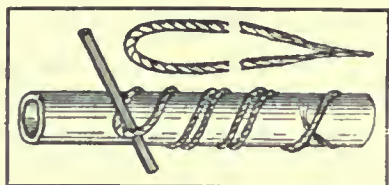
*George F. Swain, Proc. Am. Soc. C. E., Vol. XXXII, p. 517.

in mind engineers having active relations with syndicates who can be fully depended upon for trustworthy advice. The personal equation determines their fitness or unfitness. In the search for a technical advisor it must be clearly recognized that the most reliable estimates of a professional man's ability can be obtained from members of his own profession.

HOWARD D. SMITH.

San Francisco, July 28.

EMERGENCY PIPE WRENCH.—A file, cold chisel, and monkey wrench make an efficient pipe wrench, except when the pipe is too large, such as a 5 or 6-in. pipe. In such emergencies the device here illustrated will be found



very effective, says the *American Miller*. Take three or four feet of new rope. Fray out both ends thin and put them together. Commence with tip ends and wrap tightly around the pipe until you have a loop. Then with a piece of pipe or a round bar for a lever, turn the pipe as you would with a pipe wrench.

EFFECT OF HEAT ON LARD AND MACHINE OILS.—Experiments have been made for the purpose of determining the effect of higher temperatures than ordinarily occur upon the friction set up in a given bearing by the oil film between the rubbing surfaces, pressure and speed being maintained constant. The oils experimented upon were common lard and machine oils, such as are used for cutting and lubricating purposes. The results obtained are doubly interesting, because of the rather extreme conditions of pressure, speed, and temperature under which the test was run, and because of the remarkable regularity with which the points, when plotted, fall on a smooth curve. A Kingsbury oil-testing machine was used, in which a vertical spindle ran between two opposed brasses in a bath of the oil under test, which was contained in a surrounding cylindrical case. The load on the bearing was applied by a heavy helical spring, passing through the side of the case and adjusted by a screw. The oil case and its attachments were mounted upon a hollow vertical spindle free to turn on the frame of the machine. The moment of friction of the journal tending to rotate the case was balanced by the torsion set up in a tempered-steel wire by which the hollow spindle was supported, and the displacement of the case was read off in degrees from a circular arc on the frame of the machine. Heat was applied to the case and contents by means of a gas flame. The results showed that up to 180° F. the coefficients of friction of both the lard and machine oils ran nearly together, the difference being about 3% in favor of the machine oil. As the temperatures increased, producing a corresponding decrease in the viscosity of the oils, the plotted curves showed that the friction coefficients become less, reaching a minimum at 190° for the machine oil, but continuing to decrease as much as 10% more with the lard oil, the curve becoming nearly asymptotic to the temperature axis, and showing no signs of change up as high as 280°. Evidently above 190° the machine oil disintegrates, and the film between the bearing surfaces begins to break down; hence the friction increases very rapidly with the temperature.

Benitoite.

This is a new gem mineral determined and described by George Davis Louderback, associate professor of geology in the University of California.

As the investigation has shown that it is a new mineral species, it has been called benitoite, because it occurs near the headwaters of the San Benito river, in San Benito county.

The most striking characteristic of the mineral is its blue color, and selected crystals cut in the right direction produce a beautiful gem stone that rivals the sapphire in color and excels it in brilliancy. The color, however, although fairly characteristic, is not an essential property, for very commonly parts of a crystal are colorless, while occasionally perfectly colorless small crystals are found. The color also varies in intensity in different crystals or in parts of the same crystal. When pale it is a rather pure blue. When more intense it assumes a violet tint. In addition to this variation in color in different parts of crystals, there is a difference at any one point, depending on the direction in which the light passes. In other words, the mineral is strongly dichroic, the ordinary ray being colorless, the extraordinary, blue. A section cut parallel to the basal plane is practically colorless, while sections parallel to the principal axis show the deepest color. To get the finest effect, therefore, gems should be cut with the table parallel to the principal axis, and this is in contrast to the sapphire, which shows its color best when cut perpendicularly thereto. If such a section, cut so as to give the strongest color effects, be examined with a dichroscope, the contrast between the images is most striking. The image of the extraordinary ray being freed from the colorless image of the ordinary ray, presents a remarkable intensity of color, very much deeper, of course, than can be seen by looking at the mineral in any direction with the unaided eye. In the lighter parts this color of the extraordinary ray is a slightly greenish blue inclining to indigo as it becomes darker, and is very similar to one of the axial colors shown by some cordierites; but in the more highly colored or thicker parts it is an intense purplish blue.

The mineral has proved to be interesting from the standpoint of its chemical composition. Prof. W. C. Blasdale, who kindly undertook the chemical analysis, reports the following composition: SiO_2 , 43.71; TiO_2 , 19.32; and BaO , 36.97. Benitoite is then a very acid titano-silicate of barium, and stands in a class by itself, both as regards acid silicates and titano-silicates. The blue color of much of the material may be due to a small amount of titanium in the sesquioxide condition.

ALTHOUGH India has long been associated traditionally with gems and gem production, it yields at present but a small part of the world's supply of such minerals. All the gems produced in that country do not approach in value the unset stones and pearls imported, which had an average value of over a half million pounds sterling per year. By far the most important gems of Burma are the rubies. The blue sapphires formerly obtained in the Kashmir State appear to have been exhausted of late, and no records are procurable. Ruby spinel is a common associate of the true ruby in Burma both in the gravels and in the limestone rock, and is often mistaken for it. Another Burma gem stone is the red tourmaline (rubellite), and some attempts have been made to work it, as it is of fine quality. The data of production, however, are variable and imperfect. There is considerable garnet production in Jaipur, in the mica schists of Rajmahal; also near Sarwar in the adjacent State of Kishengarh.

Pioche, Nevada.

Written for the MINING AND SCIENTIFIC PRESS
By JAMES W. ABBOTT.

Pioche, the county seat of Lincoln county, Nevada, is situated 28 miles almost due north by wagon-road from Caliente, a station on the San Pedro, Los Angeles & Salt Lake Railroad, better known as the Clark road. It is expected that a branch line now in process of construction from Caliente will be opened to Pioche in September of this year, when the town will be 352 miles by rail from Salt Lake City and 485 miles from Los Angeles.

Leaving Caliente, a picturesque town at 4,400 ft. altitude, the branch railroad runs for about two miles through a canyon. This widens out into Meadow valley, which ends 18 miles above Caliente in an oasis of trees and green fields, the site of an attractive agricultural settlement known as Panaca. Again the line penetrates a canyon, very narrow in places and about three miles long, when Duck valley is entered and followed to an opening on the northern slope of the Pioche spur of the Ely range. From the valley there is a gentle rise to the town of Pioche, which lies at an altitude of about 5,800 feet.

After the vicissitudes that marked the early history of the Comstock had passed, and a daily overland stage service over the central route had been established, Nevada secured from the mining world that intense interest which had been given to California. In spite of arid climate, hostile Indians, absence of railroads and settlements, the adventurous prospector gradually scattered over Nevada; the camps of Austin, White Pine, Pioche, and Eureka, with a score of smaller ones, sprang into life and added their record to the growing frenzy. Next to Virginia City, with its world-renowned bonanzas, Pioche was for years the most famous mining camp of that period.

William Hamblin, one of Brigham Young's missionaries to the Indians, was visited at his home near St. George, Utah, in the fall of 1863, by a delegation of his wards, who had brought with them some *panacare*, which in their language meant 'silver ore.' He soon closed a bargain to pay them for their information, and going with them found and located the Panacker lode, which was his phonetic interpretation of the *panacare*. Hamblin returned home, told of his find, and brought in other prospectors, who made locations.

For years Indian hostilities delayed the opening of the camp, but each year visits were made to it and many of the locations were kept alive. In 1868 F. L. A. Pioche deputed Charles E. Hoffman to purchase for him some of the rich claims. Pioche was a native of France, an argonaut of '48, and reputed to have become very rich. Hoffman was a metallurgist of considerable note. He secured for Pioche some of the best claims, which the latter conveyed to the Meadow Valley Mining Co., a corporation organized by him for that purpose. This company soon acquired other properties and became one of the two principal factors in the region, and Pioche's camp came to be known as Pioche.

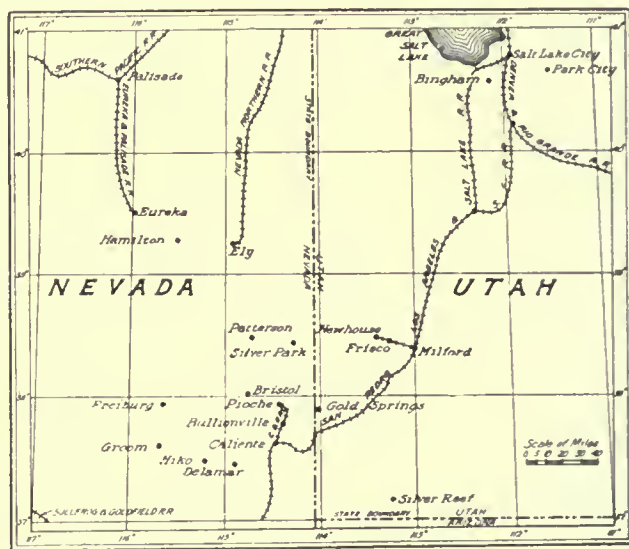
John H. Ely and William H. Raymond, who had been operating unsuccessfully in a district considerably farther south, came in a little after Hoffman and secured an option on the Burke claim, which soon developed into a high-grade mine. They then organized the Raymond & Ely Mining Co., which at once became the great rival of the Meadow Valley.

The surface ore was principally horn silver (chloride), argentite (silver sulphide), galena (lead sulphide), and cerussite (lead carbonate), in varying proportions. Naturally the first attempt to reduce them was with

crude furnaces. The necessary material for these was packed on mule-back from Elko on the Central Pacific railroad. It had come by way of San Francisco around the Horn, for the railroad still lacked hundreds of miles of a connection with the Union Pacific. The fire-bricks came from Glasgow, Scotland, and were said to have cost over a dollar apiece.

It was a most wasteful process, but the ores were so rich that it yielded a profit. Hoffman had added another furnace, a Frenchman named Chubar had erected one, and so had Raymond and Ely, before everyone realized that the excessive cost of fuel and fluxes, of shipping the lead-silver bullion to distant refineries that levied heavy charges, and the impossibility of obtaining sufficient lead to recover all the precious metals in the rapidly increasing output of ore, necessitated the adoption of some other method.

Raymond and Ely brought in a five-stamp mill that they had used in their southern operations, and erected it near Panaca on a natural millsite, which came to be known later as Bullionville. It was a crude affair, crushing wet, with 750 lb. stamps, vats, pans, and settlers. The ore was simply crushed and amalgamated

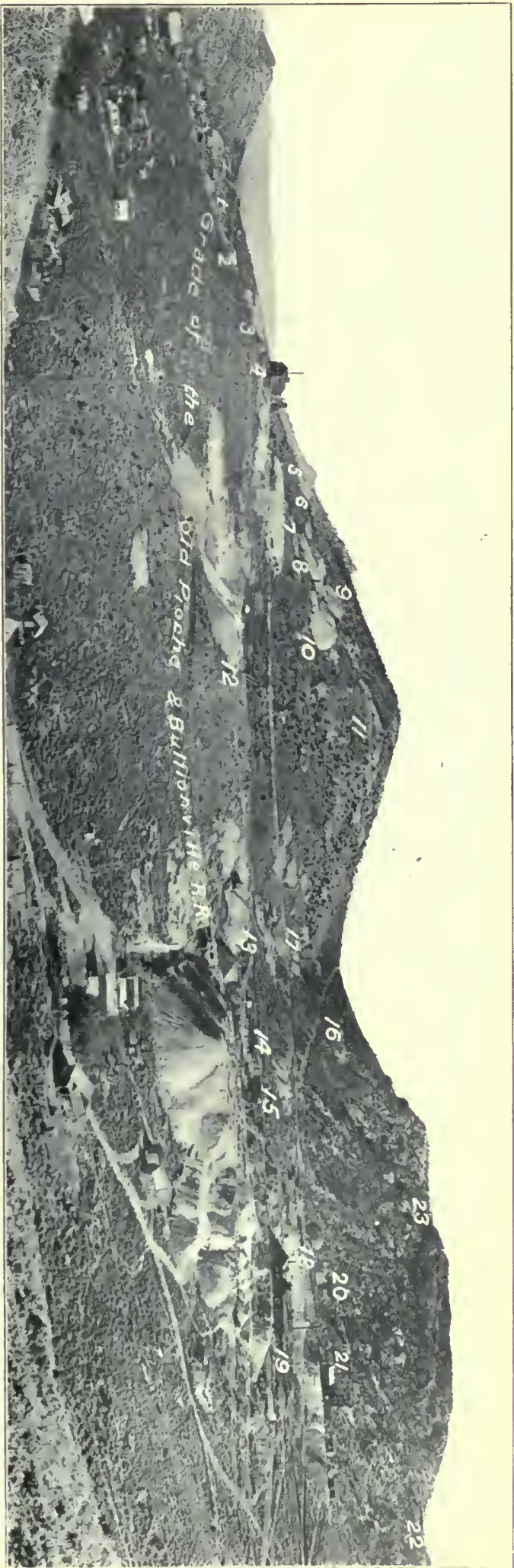


Map of Eastern Nevada.

in the pans, without chemicals or heat. For many months they crushed ten tons per day, half the precious content went into the tailing, there was a cost of \$30 per ton (which probably included mining and hauling), but there was a daily profit of \$900, and the Raymond & Ely Co. prospered greatly.

The Meadow Valley Co. erected an elaborate 20-stamp mill at Dry valley, 10 miles east of Pioche, at a cost of \$100,000. Their metallurgist was Alexis Janin, who had acquired valuable experience at White Pine. Here the regular Washoe process was practised with salt, copper sulphate, and heat, but the ores were treated raw. The amalgam was strained in boiling water. At this temperature the lead, remaining liquid, comes through with the quicksilver and a much higher grade of bullion is produced. As the lead amalgam cools, the lead crystallizes out, so that at the next straining, cold, the lead remains in the bag and lead bullion, low in silver and gold, is obtained.

Production increased with astounding rapidity and with it a pathetic call for mills to treat the ore. The Pioneer five-stamp mill of the Raymond and Ely was followed by one of ten, soon enlarged to 20 stamps. Then came a custom 15-stamp mill with a Stetefeldt furnace in which the ore was roasted with salt to convert the gold and silver to chlorides. Then came another ten, the



Panoramic View of Pioche, Nevada.

- No. 1. Dump of No. 9 originally operated by the Pioche Mining Co. on the north, or Meadow Valley, branch of main vein.
- No. 2. Meadow Valley No. 7 dump, on north branch of main vein.
- No. 3. Dump of cross-cut tunnel to Burke mine, on south branch of main vein. Shaft obscured by shaft-house.
- No. 4. Shaft-house over Meadow Valley No. 5, on north branch of main vein.
- No. 5. Dump of Yuba, or American flag, on the porphyry dike. A great producer.
- No. 6. Dump of Arkansaw, a cross-vein from the dike.
- No. 7. Dump of the Washington and Creole, on the south branch of main vein.
- No. 8. Dump of the Chapman, on cross-vein from the dike.
- No. 9. Dump of the Hubn & Hunt, on cross-vein from the dike.
- No. 10. Dump of the Mazeppa, on the porphyry dike.
- No. 11. Dump of the Deadmona, a cross-vein.
- No. 12. Meadow Valley No. 3 east of the fork, on north branch of main vein.
- No. 13. Dump of the Newark, on the porphyry dike.
- No. 14. Mouth of Zero tunnel running off toward the south.
- No. 15. Ruins of hoist over Panaca shaft, west of the fork on main vein. Out of this shaft came most of the ore from which the Raymond & Big Mining Co. paid 17 dividends, aggregating \$2,115,000 between March, 1871, and September, 1872.
- No. 16. Susan Foster hoist.
- No. 17. Dump at mouth of Amador tunnel. The mine is now generally known as the Williams.
- No. 18. Pioche West shaft-house. Belongs to Ohio-Kentucky.
- No. 19. Nevada-Tah machine-shop and Pioche Water Co.'s lower tank.
- No. 20. Alberta, one of the Ohio-Kentucky group.
- No. 21. Shaft over the Independent, now used as Nevada-Tah No. 1.
- No. 22. Upper water tank of the Pioche Water Co. About 400 ft. east of this tank the porphyry dike disappears under the shale.
- No. 23. Here a porphyry dike crops out through the limestone.

Raymond and Ely 30-stamp battery, crushing dry, with its chloridizing furnaces, and still another 10 stamps. All of these were erected at Bullionville. The Dry Valley mill was enlarged to 30 stamps, a 10-stamp plant was built in Condor canyon, a 20-stamp in Pioche, and the Mendha 10-stamp at Highland, eight miles west. But these did not fill the needs and ore was sent to Silver Park, 42 miles to the north, and even to White Pine, 160 miles away.

A smelter was built at Bristol, 20 miles to the northwest to treat the rich ores of that locality, and later a stamp-mill with pans and settlers was erected, and still later another smelter.

All this activity meant life at full tide. The following are a few of the high lights in an intensely interesting picture: A daily line of six-horse Concord coaches carrying U. S. mail and Wells-Fargo express to the Central Pacific railroad at Palisade, through Hamilton (White Pine), a similar line to Salt Lake City, both operated by the famous Western stage-men, Gilmer and Salisbury; three daily lines, two of them running six-horse Concord coaches, to Bullionville; three lines of railroad organized to build into Pioche with the utmost possible speed; the Salt Lake City, Sevier Valley & Pioche railroad (a Mormon line), the Elko, Hamilton & Pioche (a Gilmer & Salisbury line), and the Palisade, Eureka & Pioche railroad (controlled by D. O. Mills), the Western Union telegraph to San Francisco by way of Palisade (Pioche was long one of the Western Union's principal Western offices), and the Deseret telegraph (Brigham Young's line), through Salt Lake City, 32 steam-hoists with their chorus of whistles, a fast freight mule-line running day and night, with regular stations for change of stock, carrying freight under contract for delivery in five days (with penalty for failure) from Palisade to Pioche (260 miles), a narrow-gauge steam freight railroad from Pioche to Bullionville, past the mills at Dry Valley and through Condor Canyon, two daily papers with Associated Press service, in the cemetery the graves of 78 men who died a violent death, 72 saloons, 3 hurdy-gurdies (dance-halls, two white and one variegated), 32 *maisons de joie*, with intimate correlation in the last four items, two good theatres, two breweries, two gravity water-systems with street mains and fire plugs, and two hose companies, a livery stable with 300 horses, and a population in Pioche and immediate vicinity of about 10,000 people.

The Pioche range is an east and west anticlinal fold, about fifteen miles in length with Pioche near its centre, joining on the west the Highland range, the general direction of which is a little west of south. The formation normally consists of Cambrian quartzite below, shale in the middle, and limestone on top. The composition, texture, and metamorphic condition of each member differs in different places, but the quartzite is hard and tough, so that there is little tendency to disintegration either at surface or underground.

Facing the town, there is a typical fissure-vein; it runs nearly east and west, approximately parallel to the anticlinal fold in the quartzite, which has been raised between two fault-planes to a height considerably above the flanking members. This vein splits.

Dr. R. W. Raymond, then United States Commissioner of Mining Statistics, visited Pioche in 1872 and his observations are recorded in 'Mineral Resources West of the Rocky Mountains,' 1873, pages 176 to 180. Imagining his reader standing on the surface where this vein forks, he says: "Behind him rises the mountain, before and below him clusters the town of Pioche. To the right the two divergent branches of the vein are thickly set with shafts and hoisting works. They differ in their

course about twenty degrees. To the left (west) the single vein continues, barring a break, caused by a barren cross-course of brecciated mineral mischievously interjected by nature to help the lawyers. West of this bifurcation the Meadow Valley Co. holds 340 ft.; east of the same point the same company holds 1,520 ft. of continuous mining ground, through the whole of which the workings of the company extend, constituting a magnificent mine. Next to the Meadow Valley mine on the west comes the Panaca mine of the Raymond & Ely Co., containing the most remarkable body of high-grade ore now to be seen on the Coast."

Several hundred feet south of this vein, between it and the top of the mountain and also running approximately east and west, is a porphyry (rhyolite) dike, which has probably played a controlling influence upon the formation of all the orebodies in the hill. Running into this dike in various directions, through it, across it, and alongside of it, are seams of all sizes and kinds. Upon the veins and seams above described were located the claims of the numerous companies whose varying fortunes constituted in the main the history of Pioche, a history so complex and involved that no analysis of it could be made in a short article. Remoteness from the railroad, the inevitable change in the character of the ore as depth was gained, legal controversies, quarrels about how the drainage should be handled, and the water problem generally below 1,200 ft., frenzied gambling on the San Francisco Stock Exchange, the failure of the Bank of California in 1875 (which bankrupted the principal stockholders in both the great companies) were all contributing factors in the decadence and final paralysis that followed the boom.

A new day has dawned for Pioche. When the railroad comes the mines will again be opened. Large bodies of ore that could not be handled profitably in the early days are still left in the various properties. Much virgin ground exists above the water-level, the vein dips toward the porphyry dike, in which splendid bodies of ore were disclosed before the pumps were pulled. What is to be found where the vein and the dike join will not be known until the junction is reached, but there is reason to expect important orebodies. The old dumps at Bullionville, Dry Valley, Condor Canyon, and the mines of the district possess ore known to be worth \$5,000,000, and this material will all be profitably treated. What the district has actually produced in money received for ore and bullion will never be known. There is good reason to believe that it exceeded \$40,000,000. This came principally from high-grade ore. The new Pioche will be able to produce a large tonnage, with all facilities for handling medium-grade complex ores. Gold, silver, lead, copper, and zinc in large quantities are now found in Pioche and its tributary camps.

The Nevada Utah Mines & Smelters Corporation owns the property once held by the Raymond & Ely and Meadow Valley companies, including some of the best mines in the Bristol district, the Half Moon and Manhattan groups, and its joint holdings with the Ohio Kentucky.

The Ohio Kentucky Mining Co. (a Newhouse corporation), owns a group of which the Susan Duster, a comparatively new discovery of great promise, has been most developed. A porphyry dike having no known connection with the main porphyry dike of the region runs through this property. The company owns jointly with the Nevada Utah some of the best of the old mines on the main porphyry dike. The Phenix Reduction Co. (another Newhouse corporation), owns an extremely valuable group of silver-lead-iron claims near Pioche and the tailing piles at Bullionville and Dry Valley.

Other companies, some of them owning deposits of large value, are actively at work, and most of them will be shippers as soon as the railroad reaches Pioche. Without disparagement to any properties of merit inevitably overlooked in preparing such a list, there may be mentioned as immediately or prospectively within the shipping class: The Bristol Consolidated Mining Co., the Butte & Bristol Mining Co., the Ida May Annex group, the California Pioche Consolidated Mining Co., the Bristol Pioche Mines Co., the Poorman, the Mendha Nevada Mining Co., the Demijohn Pioche Mining Co., the Boston & Pioche Mining Co., the Lincoln Nevada Mining & Milling Co., the Lyndon Mines Co., the Ely Valley group, the Nevada Horn Silver Mining Co., the Pioche Mines Co., and the Cuprite King, West Point, and Milwaukee groups.*

Production of Lead.

The United States Geological Survey has issued a preliminary statement covering the production of lead in 1906. This has been prepared by J. M. Boutwell.

The following statement of the production of refined lead in the United States during 1906 embraces all desilverized lead produced at works in this country and the pig lead recovered from the Mississippi Valley lead ores. It is exclusive of a product of 10,516 tons antimonial lead reported by refineries. About 25,000 tons of pig lead derived from the Mississippi Valley ores was desilverized and is therefore included under desilverized lead and not under soft lead.

	Tons.
Production of desilverized lead	313,888
Production of soft lead.....	90,783
Total production of refined lead.....	404,669

The figures for consumption include end products only. Thus: Stocks, both domestic and foreign, and production are in terms of refined lead, imports and exports are in finished state, and antimonial lead is in marketable form, while lead in ores and bullion is excluded.

CONSUMPTION OF LEAD IN THE UNITED STATES IN 1906.

Supply—	Tons.
Stock, domestic, beginning of year.....	3,975
Stock, foreign, beginning of year.....	56
Total production, refined lead.....	404,669
Total production, antimonial lead	10,516
Imports, foreign refined	11,783
Total available	431,009
Withdrawn—	
Stock, domestic, close of year.....	4,571
Stock, foreign, in bond, close of year	64
Refined in bond from foreign base bullion and ores and exported.....	48,558
Lead in manufactures exported under drawback	1,518
Total withdrawn.....	54,709
Apparent consumption of lead in the United States in 1906	376,300
Quantity, tons. Percentage.	
Increase in consumption in 1906.....	29,285 8.44

The product of refined lead cannot be apportioned according to sources of ore from which it was derived, owing to the fact that lead refineries treat products which are secondary and are derived from diverse sources. The identity of ore, and thus its original source, is preserved only as far as the smelter. Accordingly, the following table showing sources of lead produced in the United States is based upon smelter figures. It includes 'pig lead' reported by all known smelters running on Mississippi Valley lead ores, and 'lead' produced at all other known lead smelters in this country. Returns from all known Canadian lead smelters state that in 1906 they did not treat any lead ores from the United States.

* The writer desires to express to Mr. Fred. J. Pack of the University of Utah his acknowledgments for valuable information derived for this article from his monograph on the geology of Pioche, published in No. 3 and 4, Vol. XXVII, *School of Mines Quarterly*.

SOURCES OF LEAD PRODUCED IN THE UNITED STATES IN 1906.

United States—	Tons.
Alaska.....	8
Arizona.....	2,881
California.....	432
Colorado.....	50,497
Idaho.....	117,117
Illinois.....	572
Iowa.....	270
Kansas.....	1,932
Kentucky.....	44
Missouri.....	111,075
Montana.....	2,185
Nevada.....	1,669
New Mexico.....	640
Tennessee.....	11
Utah.....	56,260
Washington.....	46
Wisconsin.....	1,753
Total from domestic ores.....	347,695
Foreign—	
British Columbia.....	7,238
Central America.....	112
China.....	18
Mexico.....	48,839
Total from foreign ores*.....	56,207
Other sources—	
Zinc residues.....	2,053
Undistributed†.....	405
Total miscellaneous.....	2,458
Grand total, derived from all sources.....	406,360

*Exclusive of 12,339 tons lead derived from Mexican bullion.
†Including, according to special reports, 25 tons lead from Texas.

The Prospector.

Enquiries sent to this department are answered free of charge, is submitted by subscribers who are not in arrears. The full name and post-office address of the sender must be given, otherwise no answer will be made. Those who are not subscribers must accompany their questions with a fee of \$3 for each question. No assays are made.

The specimen from Sacramento marked B. W. is Obsidian.

The specimen from F. B. W., of Gardiner, Mont., has not been received.

The blue-black mineral in the andesite marked 'Comer' is Magnetite.

We have not received the rock specimens from H. L. S., of Zihuatanejo, Mexico.

The calcareous Shale from A. G. of Tombstone, has no value unless it could be used in the manufacture of cement.

C. T., Paris, Cal. Ordinary opal has no value. The value of the gem variety depends upon its beauty, especially the play of delicate colors.

The brownish flakes in the andesite sent from Tonopah by E. A. C. are decomposed Biotite. Another type of alteration gives glossy white flakes.

The specimen of mineralized Basalt sent from Valdez, Alaska, by W. H. B., might carry gold and silver, though we would hardly expect it to be of value.

W. C. R. sends from Aura, Nevada: No. 1, Quartz, Chalcocite, Malachite, and Azurite; No. 2, Quartz stained with copper; No. 8, Quartz and Limonite; No. 4, Opal and specular Hematite.

The six rock specimens sent from Silver City, New Mexico, by T. L. G., are: No. 1, Basalt; No. 2, Quartz, Calcite, etc., and probably a decomposed Andesite; No. 3, Sandstone; No. 1, altered Andesite; No. 5, Basalt; No. 6, Andesite.

Lodes in the Tertiary Eruptives of Colorado.

Written for the MINING AND SCIENTIFIC PRESS
By T. A. RICKARD.

These form the prevailing rock in several important mining districts, notably Cripple Creek and the San Juan region, the latter being a comprehensive name covering a group of five counties in the southwestern portion of the State. The relative age and chief characteristics of these new volcanics are best studied among the mountains of the San Juan, where their relation to the earlier sedimentaries is made evident in a number of splendid sections. These show the Mesozoic rocks to be unconformably covered by a bed of Tertiary conglomerate, which, in turn, is conformably overlaid by a vast thickness of volcanic breccias, alternating with various flows of lava, the entire succession forming a rock-series of great interest both to the geologist and to the miner.

The conglomerate under the breccia is notable as being the youngest sedimentary terrain in which profitable gold-mining is being carried on within the boundaries of Colorado. Whitman Cross named it the San Miguel formation, but upon ascertaining that this term had been used previously by the Texas geologists he changed it to the 'Telluride' formation.¹ The evidence indicates that it is of early Eocene age.² It is a conglomerate of varying texture, usually coarse where it is thin, and graduating into fine-grained grits where it attains a considerable thickness; this ranges from about 200 ft. to a maximum of 800 to 1,000 ft. In Canyon creek, above Ouray, and in Bear creek, near Telluride, excellent exposures of this conglomerate can be observed. It is traversed by gold lodes. Of these, the Contention vein is the most important.

The workings of the Contention mine follow a vein into both the andesite breccia and the underlying conglomerate, as shown in Fig. 1. The vein marks the line of a fault, the vertical throw of which is 58 ft. Under the conglomerate comes the unconformity that marks the line of contact with the older sedimentaries, represented by Jurassic sandstone and shale. The measurement of the fault was made in a ravine that approximately follows the line of dislocation, the extent of which was made clear by comparing the severed portions of a bed, eight feet thick, of agglomerate, yellowish red in color, forming a well defined parting between the top of the conglomerate and the base of the breccia.

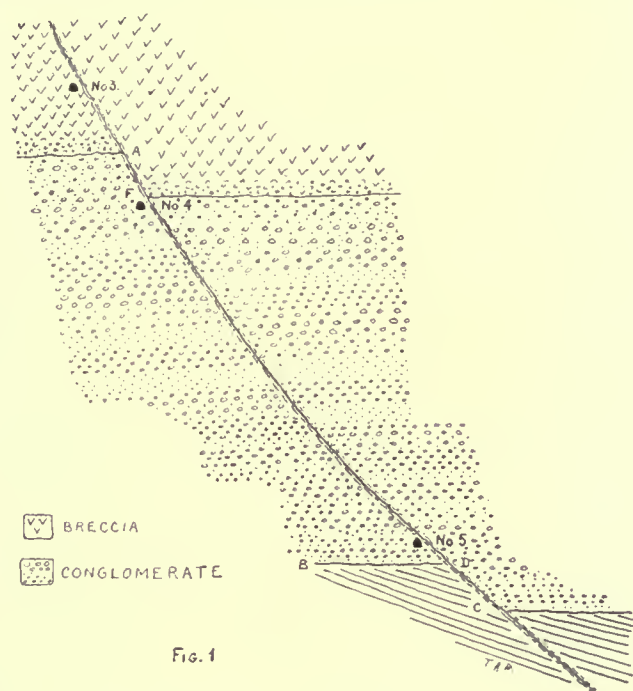
Fig. 2 and 3 illustrate the vein when traversing conglomerate and breccia, respectively. In the former the vein-stuff under the hanging wall consists of quartz-filling in a matrix of crushed conglomerate, while the under- and larger-portion of the width enclosed within the apparent boundaries of the lode consists of conglomerate that is obviously little altered, although partially shattered. The separation from the outer country is marked by selvages of clay. When the vein is in breccia (Fig. 3), the filling is crushed and cemented by the quartz in which the gold is disseminated. Within the lode there are irregular streaks of clay and dark pieces of the andesite surrounded by quartz. The boundaries of the lode are marked by parallel seams of clay and an outer casing of shaly country.

The best ore was found in the lower adits, which are situated near the base of the conglomerate. This averaged \$8 to \$8.50 for a width of 30 inches. In ascending, the vein becomes poorer; in the breccia it is smaller and the occurrence of ore is more erratic, although probably

as rich as in the conglomerate. In descending, and when penetrating the Jurassic sandstone and shales, the Contention vein becomes unprofitable and no exploitation has been tried beyond a little exploratory work.

The Telluride formation rests upon the succession of older rocks so as to indicate an unconformity of far-reaching extent. This has been proved by the work of the U. S. Geological Survey, under Whitman Cross, who, speaking of this bed of conglomerate, says: "Its base is first found resting on the Colorado Cretaceous shales and from that horizon gradually descends, transgressing the edge of the Colorado and Dakota Cretaceous, the entire thickness of the Jura, and is seen in contact with the Trias. In the districts south of Silverton it is believed that the Telluride conglomerate passes over the entire Paleozoic section and may come to a contact with the Algonkian quartzite of the Needle Mountain area."³

There is reason to believe that the Telluride formation may be correlated with the 'Arapahoe conglomerates' of the Denver basin, this being a series 900 ft. thick, made



up of clays, sandstones, and conglomerates overlaid by the so-called 'Denver beds,' which consist largely of fragmentary conglomeratic andesite, especially where they rest upon the Arapahoe. There is also a suggestive correspondence between the relations of the Denver andesite debris and the Arapahoe conglomerate on the one hand and the San Juan andesite breccia and its underlying Telluride conglomerate. This indicates that big lava-fields of andesite existed formerly in the mountains behind Denver and these, by erosion, were removed and then laid down as sediment in the waters of the Denver basin; it is likely that this process of removal continued until erosion had cut down into the rocks on which the lava lay, because in the upper portion of the Denver series there is a notable increase of Archean schist in the composition of the conglomerate, the coarseness of which is also more marked.⁴

The variations in the composition of the Telluride conglomerate are evidently traceable to the variety of the underlying rocks by the disintegration of which the material of the conglomerate itself was obtained. Pebbles of quartzite, limestone, sandstone, schist, granite, and diorite all enter into the composition of the conglomerate.

¹The age of these rocks was first recognized by R. C. Hills. See *Proceedings Colorado Scientific Society*, Vol. III, p. 174, December, 1888. See also 'The San Miguel Formation,' by Whitman Cross. *Proceedings Colo. Sci. Soc.*, Vol. V, pp. 235 to 241, September, 1896.

²Dr. C. Hills. 'Orographic and Structural Features of Rocky Mountain Geology.' *Proceedings Colo. Sci. Soc.*, Vol. III, p. 407.

³*Proceedings Colo. Sci. Soc.*, Vol. V, p. 236.

⁴Geology of the Denver Basin in Colorado, by S. F. Emmons, Whitman Cross, and George Eldridge. U. S. Geol. Survey, Monograph XXV11, pp. 202 and 203.

The period during which the San Miguel formation was laid down apparently just preceded the first of a cycle of volcanic eruptions, which occurred in the San Juan region in early Tertiary time. The conglomerate was probably still under water when it became covered with the products of volcanic eruption in the form of showers of fragmental rock, now appearing as beds of tuff and breccia of enormous thickness. This is the San Juan formation.⁵ It consists essentially of fragmentary andesite and attains a thickness of 2,000 to 2,500 ft. A good section of the entire series of beds can be seen on the trail going up to the Sheridan mine from the upper San Miguel valley at Pandora.

Numerous veins, rich in the precious metals, traverse this formation; they can be observed as bands of bleached and iron-stained rock, appearing as seams on the face of the dark cliffs and making deep trenches on the ridges where weathering has eroded them. These veins have made the San Juan region a great mining country. They are probably the most persistent lodes in Colorado; while

extruded not from one, but, in all probability, from several vents, none has yet been found. It is most likely that the crystalline rock which finally plugged any volcanic throats that may have existed, now forms the core of one or more of the mountain masses of the region and that subsequent erosion has spent itself upon the softer breccia, cutting deep ravines through it and into the underlying sedimentaries, over which the far-reaching volcanic débris was ejected with such lavish profusion.

The volcanic area of the San Juan is separated from the Cripple Creek region by the deep channel of the Arkansas river and the serrated range of the Sangre de Cristo. It is about 70 miles from the northeasterly edge of the one to the southwesterly outskirts of the other. Midway between them, although not directly between, there is a small group of volcanoes forming the Rosita hills, among

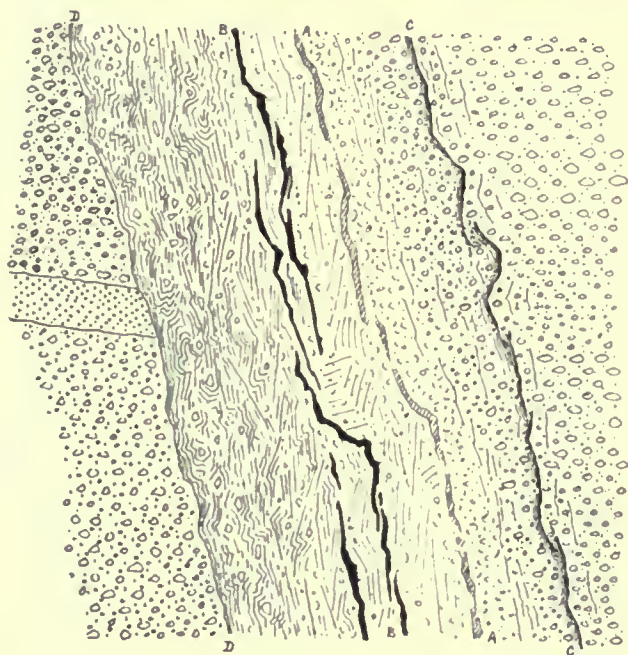


Fig. 2.

they have been worked for a notable linear extent, they have also been proved to be profitable to an unusual depth. Thus, the Virginus vein, on the Ouray side, has been worked for a longitudinal distance of over 3,000 ft., and to a vertical depth of 3,300 ft., while the Smuggler-Union has produced ore for a length of nearly two miles along the vein and to a depth of 1,200 ft.

In considering the depositories of gold and silver which occur in Tertiary eruptives one cannot omit a reference to the Cripple Creek district, although a good deal has already been written on the subject.⁶ Cripple Creek is of particular interest when regarded from the standpoint of the present paper because it is a goldfield where Eocene volcanics abut against pre-Cambrian granite, and the gold-veins penetrate both. At Cripple Creek, moreover, a true volcano existed. In the San Juan region the occurrence of enormous masses of fragmentary volcanic material has not been connected with specific points of eruption. Although the breccia must have been

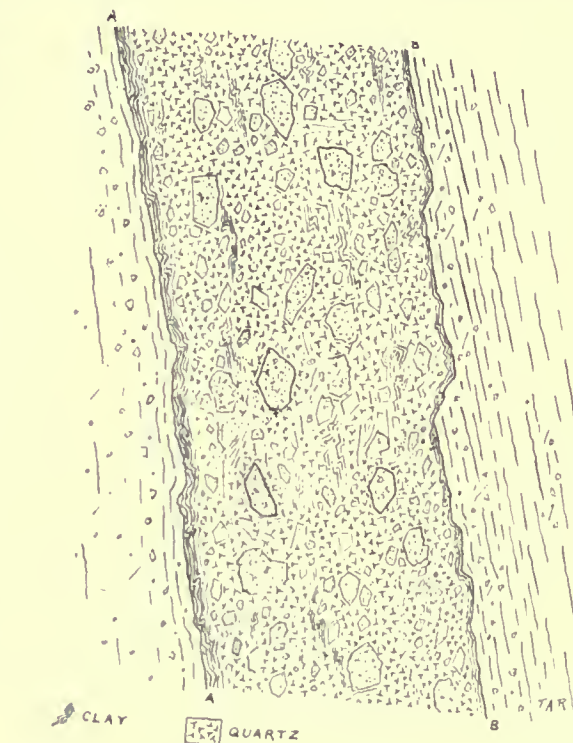


Fig. 3.

⁵ 'Igneous Rocks of the Telluride District,' by Whitman Cross. *Proceedings Colo. Sci. Soc.* Vol. V, pp. 225 to 234.

Also 'Mining Industries of the Telluride Quadrangle, Colorado,' by C. W. Purlington. 1898. U. S. Geol. Sur. Report. Page 761.

⁶ 'The Geology and Mining Industry of the Cripple Creek District, Colorado,' by Whitman Cross and R. A. F. Penrose, Jr., U. S. Geol. Sur. 1896.

⁷ 'The Cripple Creek Goldfield,' by T. A. Rickard. *Proceedings Inst. Min. & Met.* London, 1899. Vol. VII, pp. 49 to 96.

⁸ 'The Cripple Creek Volcano,' by T. A. Rickard. *Transactions Amer. Inst. Min. Eng.* New York, 1900. Vol. XXX, pp. 367 to 403.

which the mining district of Silver Cliff is situated. Here extraordinary occurrences of rich silver ore have been found actually lying in what appear to be undoubted volcanic conduits, the result, apparently, of such fumaroles or vapor vents as usually mark the last stages of volcanic activity. In the case of the two principal occurrences, in the Bassick and Bull-Domingo mines,⁷ the rich ore has formed a coating upon pieces of agglomerate lying in chimney-like openings through which aqueous vapors, rather than dry gases, must have circulated. This district, situated in a depression between the Sangre de Cristo and the Wet Mountains, serves as a link between the San Juan and Cripple Creek. The latter, which is 40 miles to the north, is to be studied in the light furnished by the miniature volcanic complex of Rosita. Both may be considered, according to Whitman Cross, "as small outlying vents connected in origin with the much larger eruptives of the San Juan and of the South Park regions, which were in part also of Eocene age, though probably continuing into the Miocene."⁸ To the miner the two districts present a great contrast, Rosita being characterized by local enrichments which

⁷ 'The Mines of Custer County,' by S. F. Emmons. U. S. Geol. Sur., 1896.

⁸ 'Some Mines of Rosita and Silver Cliff, Colorado,' by S. F. Emmons. *Trans. Amer. Inst. Min. Eng.* Vol. XXVI, pp. 773 to 823.

⁹ 'Geology of Silver Cliff and the Rosita Hills, Colorado,' by Whitman Cross. U. S. Geol. Sur., 1896, p. 273.

were uncertain and short-lived, while Cripple Creek has permitted of extensive and successful mining over a long period of time. Both are characterized by several small vents and a succession of eruptions rather than one period of overmastering energy. Both illustrate the complete cycle that marks the life history of a volcano, from the gradual accumulation of energy which causes the first spasmodic eruption to the slowly dying breath of solfataric action and the outpouring of thermal waters; the last being, it is believed, the period most to be identified with the formation of ore.

The mining district of Cripple Creek is co-extensive with an eruptive complex of restricted area, covering about nine square miles and occupying the basal wreck of a Tertiary volcano. It is situated amid the granite of Pike's Peak and consists of a body of breccia, chiefly andesite, which lies upon the worn surface of the granite and fills the deep basin around the volcanic throat. The exact locality of the latter is unknown but the approximate position is inferred from the relations between the crystalline lavas which were the last to be extruded and there is reason to suppose that there were at least two vents, if not more.⁹ The granite is usually referred to as Archean but it is only known for certain that it is of pre-Cambrian age. Evidence obtainable through correlation with the fossil beds of Florissant, 15 miles to the north, warrants the conclusion that the Cripple Creek volcano is of late Eocene age or early Miocene.¹⁰ While andesite breccia is the prevailing rock, the district is especially characterized by later dikes of phonolite as well as nepheline basalt and diabase. The occurrence of rich gold ore is clearly associated with these dikes, and presents a great variety of conditions, structural and petrographic.

A large number of gold veins have been discovered as the result of vigorous explorations during the past fifteen years and a depth of 1,200 ft. has been attained by several mines. The underground workings disclose an intricate network of interlacing goldbearing fractures, which, in different portions of the mining area, are grouped by similarity of strike and they have been found to have a course sympathetic to the dikes, especially the hard phonolite, even when they do not actually run alongside the latter. The veins that were first found near the edge of the breccia have, in many instances, been followed by workings which have penetrated into the underlying granite and it has been proved that the orebodies do persist into this lower geological horizon. The distribution of the richest portions, or 'bonanzas,' of these orebodies presents the same perplexing features as on other gold-fields. A great deal of interesting evidence has, however, been obtainable as a consequence of the extensive development that has followed in the wake of profitable mining.

THE British report from the oilfields in the Baku-district of Russia, is to the effect that steam turbines have lately come into use for driving electric dynamos, and for pumping installations. They have also been tried with some success for driving the drilling rigs, and baling drums in wells. Their chief object, besides a slight economy in steam over the ordinary engine, is their compactness and the comparative ease with which they can be removed from one well to another. Oil motors are used for driving the drilling machinery in prospecting wells, and for pumping installations. These motors must be made to burn crude oil, as kerosene or benzine is too expensive.

Mining in New South Wales.

The mineral output of New South Wales for the year 1906 was valued at \$40,848,120. This is an increase over that for 1905, which previously stood as a record, of \$5,418,655. The aggregate value of all minerals won in this State to the end of 1906 was \$862,801,910. The total number of persons employed in and about the mines of the State during the year is estimated at 42,546, being 3,614 in excess of the number employed in 1905. The gold produced to the end of 1906 amounted to 12,786,638 oz. fine, valued at \$271,570,810. The yield recorded for 1906 was 253,987 oz. fine, valued at \$5,394,330; this was 20,280 oz. fine, and \$430,735 less than in 1905. These figures do not, however, accurately reflect the position of the industry, as gold to the further value of \$800,590 was purchased from the mines within this State, but was not lodged at the mint and could not be included in the official figures for 1906. This gold has, therefore, to be carried forward to the year 1907. The yield was contributed by the established mines, no new find of importance having been recorded during the year. The value of the exports from the silver-lead mines is as follows: Silver, silver-lead, concentrate, ore, etc., \$14,314,865; pig lead, \$5,420; zinc (spelter and concentrate), \$1,464,030, a total value of \$15,784,315. This exceeds the value of the output for 1905 by \$2,194,995, and since the year 1903 the value of the output has increased by \$7,651,435. The value of the output of copper was \$3,947,635, an increase of \$1,310,620 on that of the previous year. The tin and tin ore produced during the year was valued at \$1,278,720, and was in excess of that of the previous year by \$148,170. This output exceeds that of any other year since 1888. The value of the output from the tin fields of the State to the end of 1906 is \$38,722,545, and the number of men employed in this branch of the industry during 1906 was 3,795, an increase of 911 compared with the previous year. The coal raised during 1906 was 7,626,362 tons, valued at \$11,686,135, and exceeded that of the previous year by 994,224 tons and \$1,668,830 in value. These figures constitute a record. In the course of the last two years the output has shown an expansion of 1,606,553 tons. The coal exported during the year amounted to 4,901,760 tons, valued at \$10,381,115. This is much the largest quantity ever dispatched from the State, and shows an increase of 1,183,707 tons, and \$2,461,225 in value on that of the previous year. The number of person engaged in the mining for coal during the year was 14,929, an increase of 910 compared with 1905. The value of the coke manufactured during 1906 was \$553,035, being an increase of \$51,505 on that of the previous year, the industry having benefited largely by the greater activity in metalliferous mining. The value of the other minerals produced during the years was as follows: Alunite, \$23,185; antimony, \$263,225; bismuth, \$28,500; diamonds, \$10,600; iron (from scrap), \$564,240; lime, \$77,865; limestone flux, \$37,315; portland cement, \$642,435; marble, \$7,570; molybdenite, \$23,990; opal, \$282,500; platinum, \$3,115; scheelite, \$38,235; wolfram, \$45,285; sundry minerals, \$13,520.

RUBIES IN BURMA.—The mineral resources of Burma have never been fully developed, but the most valuable at present are rubies, jade, and amber, tin, coal, gold, and marble. The larger part of the world's supply of rubies comes from Burma. These are obtained by mining in the ruby district, which lies 80 miles northeast of Mandalay. The earth is mined and run through pug-mills, the dirt washed away, and the stones collected, inspected, and sorted.

⁹A miniature vent, about 35 ft. wide, can be seen in a railway cutting near Victor. See 'The Cripple Creek Volcano,' by T. A. Rickard. *Trans. Amer. Inst. Min. Eng.* Vol. XXX, p. 379.

¹⁰Whitman Cross. 'Geology of the Cripple Creek District.' p. 18.

Sinking Through Bad Ground.

Written for the MINING AND SCIENTIFIC PRESS
By F. W. ADGATE.

Timber and concrete have been used recently with success in sinking a shaft on the Mesabi range, near Biwabik, Minnesota. This work is of interest, owing to the extreme difficulties overcome, and the novel application of the pneumatic process to this class of construction. The shaft was sunk for the Syracuse Mining Co. (a subsidiary of the Pickands, Mather & Co.'s holdings), to open up a mine containing a rich deposit of iron ore.

The history of the previous efforts to put down this shaft is a two-year record of disappointment and expenditure of money. The orebody is situated adjacent to, and running under, a lake of considerable size, which surrounds the ore on two sides. Immediately on top of the deposit there is 45 ft. of treacherous quicksand. Owing to the proximity of the lake the ground is saturated with water, and it is difficult to sink a shaft through it by any ordinary process.

The mining company, realizing this, made an arrangement with the patentee of a method of sinking open shafts through water-bearing material, adopting his method and employing him to superintend the work. They began operations in December, 1904. The method consisted of a series of cofferdams driven inside of each other, the first one being sufficiently large to provide space for the other dams inside of it. Eighteen-foot wooden staves or sheet-piles were driven down around two sets of walling timbers, and the excavation started inside the staves.

The first cofferdam being completed, the excavation and pumping was started inside of it. Very slow downward progress was made, however, as the flow of water and sand was too much for the pumps. The next set of staves was started, but landed on top of a bed of large boulders and could not be forced down. By this time four No. 10 Cameron pumps could not handle the inflow of sand and water, and it became apparent that the work could not be successfully accomplished by this method. After a four months' trial the mining company decided to stop all operations at this point, and to sink a shaft at a point some two hundred feet farther south. Here the overburden is 50 ft. greater, but the chance of avoiding the boulders was considered much better.

The mining plant previously installed was accordingly moved to the proposed site. At the new site, the company with their own force sank a large timber shaft to the quicksand (about 50 ft.) by the method commonly employed on the Mesabi range. This consists of suspending sets of timber, about three feet apart, from the surface. As the excavation proceeds 2 by 10 in. planks, 4 ft. long, are slipped in back of these timbers, forming a comparatively tight wall to keep out the soil. Each course of waling timbers, or each set as it is locally called, is suspended from the set of timbers immediately above it by 1½-in. bolts, the top set of timbers in turn being connected in a like manner to large round timbers, called bearing timbers, on the surface, spanning the excavation and carrying the weight of the shaft until it rests on the bottom.

From the surface of the quicksand it was the intention to drive steel sheet-piling to bedrock. The shaft was accordingly built large enough to permit a steel sheet-pile cofferdam at the bottom of, and inside, the timber shaft. Work was started on driving the steel sheet-piling in November, 1905, and continued until the following spring. The piling was driven from an ordinary pile-driver derrick, which rested on the timber shaft at

the surface, and was sent home by means of a special follower designed by the manufacturers of the steel piling. A 3,000-lb. hammer was used, and at one period of the work a water jet was also employed to assist the work of the hammer. The piles were driven very hard and were of the heaviest section turned out by the manufacturers.

After the pile cofferdam was completed, a No. 10 Cameron pump was installed and the excavation started inside the steel piling, waling pieces and struts being introduced about ever three feet as the work progressed, to keep the piles in place. The excavating was accomplished without much difficulty to a point about 20 ft. below the top of the piles. Below this point it proceeded very slowly. After taking out a few feet of material the quicksand would suddenly start to boil up from the bottom, accompanied by a corresponding movement of the material on the outside of the shaft. This distorted the timber shaft and cracked its timbers.

It became evident to those in charge that there must be a bad leak or break in the steel sheet-piling, and means were at once adopted to overcome this difficulty. A crib of 10 by 10 in. timbers, 3 ft. high, was built at the bottom of the excavation inside the shaft, the intention being to load this crib and force it down with the hope that it would overlap the leak or break in the piling, and that then work could be prosecuted successfully. The crib was forced down a few feet and then stuck and very little, if anything, was gained by the scheme. In the meantime each period of excavation was followed by an upward boiling of the quicksand at the bottom. The material around the outside of the shaft settled away, leaving the upper part of the shaft exposed. Hay, straw, etc., were placed outside the shaft with the hope that at each settlement of the sand, this material would be carried down outside the steel piling and ultimately stop the leak in it.

At this stage it became necessary to support the timber shaft, as it had broken away from the bearing timbers at the surface, and was settling down and telescoping the steel cofferdam. This was accomplished by stretching railroad rails and timbers across the top of the cofferdam and under one of the sets of timber of the wooden shaft, allowing the timber shaft to take a bearing on them. Pumping was then resumed and pieces of sheet iron were forced down alongside the sheet-piles and every effort was made to find and stop the holes where the quicksand was entering the shaft. As a last resort grout was pumped down to bedrock through a two-inch pipe, it being withdrawn and moved frequently. This was allowed time to harden and the excavation was resumed. After advancing a few feet, the sand and water broke in from the bottom and boiled up as usual. On the first of August the Mining Company decided that the shaft could not be sunk by ordinary methods, and they then called upon the Foundation Company, of New York, to devise plans and contract to sink the shaft far enough into the bedrock to make a watertight joint with the rock.

The Foundation Company began operations early in October, 1906. Their plan was to line the upper or timber part of the old shaft with reinforced concrete, leaving a shaft 13 ft. 6 in. by 6 ft. 1 in. and having two hoisting compartments 4 ft. 6 in. by 6 ft. 1 in. at each end and one compartment 6 ft. 1 in. by 3 ft. 6 in. at the centre for a pipe and ladder-way. A concrete roof was then to be built on the upper ends of the steel sheet-piling. The material inside the steel sheet-piling was to be excavated and the shaft below the roof lined with 10 by 12 in. timbers, all to be done under air pressure. The timber was to be thoroughly caulked, course by course, until a joint was made between the bottom timber and the lode.

Provision was made to suspend the entire weight of the timber lining from the roof until it rested on bedrock.

It was then decided to pump out the shaft as low as it had been excavated, about 18 ft. below the tops of the steel sheet-piles, and timber from that point up to the point where the concrete roof was to go in; next, to construct the roof and line the old timber shaft with concrete from the top of the roof to the surface of the ground. On account of the dangerous condition of the timber shaft and because of the fact that it had been strengthened from time to time with cross-braces, which left but little working room in the shaft, this order of operations was found to be impracticable. It was evident that the first thing that must be done was to secure and make safe the old timber shaft. Work was immediately begun on this, the first thing done being to transfer the weight of the shaft from the tops of the sheet-piles to the surface of the ground. This was accomplished by putting in some extra heavy bearing timbers 60 ft. long across the top of the shaft at the surface. The old shaft was connected by twelve 1½-in. bolts to these timbers. The cross-timbers and rails on which the shaft formerly rested were then cut out and the shaft was again suspended from the surface.

A space two feet long was now cleared of bracing, broken struts, etc., at the bottom of the timber shaft and a concrete form started to line the shaft. Great care had to be taken in cutting out and shifting the struts and braces to make room for the concrete, which was deposited in sections about two feet high. The timber in the shaft was cracking and moving a good deal while this work was being done, and it was hard to get men to stay in the shaft. A few of the cross-braces were concreted in, and after the concrete had set they were cut out and the ends dug out of the concrete, the resulting space being filled with concrete. This work necessarily proceeded very slowly, temporary braces and jacks being used and continually shifted. Then, too, the scarcity and poor quality of the only labor available tended to make the work go slowly. On November 9, the concrete lining had reached a point 10 ft. from the top of the shaft and it was then considered to be in a perfectly safe condition.

Horizontal reinforcing rods ½-in. square, spaced 12 in. centre to centre, vertically, were used in the concrete lining. A recess 6 by 18 in. was left one foot from the bottom of the side and end walls to permit the concrete roof to be keyed into them. The shaft was then pumped out to the sand, about 18 ft. below the bottom of the proposed concrete roof, and the work of lining the shaft from this point to the bottom of the roof with 10 by 12-in. timbers was commenced. This also was a ticklish piece of work, as the bracing then in the shaft at this point had to be removed and solid timbering substituted. The sides and ends of the shaft were lined, starting from the sand, one course or set of timbers resting immediately on the one below it. The joints between the different sets were well caulked and hawsed with oakum.

The shaft was braced transversely by two solid walls of 6 by 12-in. timbers, each placed 1 ft. 9 in. from the centre of the shaft. These also served as walls and subdivided the shaft into three chambers, thus: A skid-way at each end 4 ft. 6 in. by 6 ft. 1 in. and a pipe and ladder-way 6 ft. 1 in. by 3 ft. 6 in. at the centre. In the four corners of the shaft were 3½ by 3½ by ½-in. angles bolted to each set. These secured and braced the ends of the timbers in a most satisfactory manner. The form for the roof was then suspended from 12 by 12-in. timbers extending across the finished concrete walls of the shaft by twelve 1½-in. bolts, and work on the concrete roof was started. The roof consisted of a slab of concrete 5 ft. thick, the size of the shaft, and extending into the recess

left when the lining was built, as before mentioned. The roof was heavily reinforced with 1½-in. steel bars running horizontally in both directions about six inches. Eight 1½-in. steel bolts were built into the roof, and after the roof had hardened sufficiently, the weight of the timbering below the roof, which was built on the sand bottom, was transferred to these bolts so the sand could be excavated below the timber without danger of settlement.

A section of 48 in. air-shaft had also been built into the roof, and when the concrete had attained sufficient hardness this shaft was continued up to a point 30 ft. above the roof. A Moran air-lock was then connected to the top of the air-shaft and air was turned into the shaft on December 18, 1906.

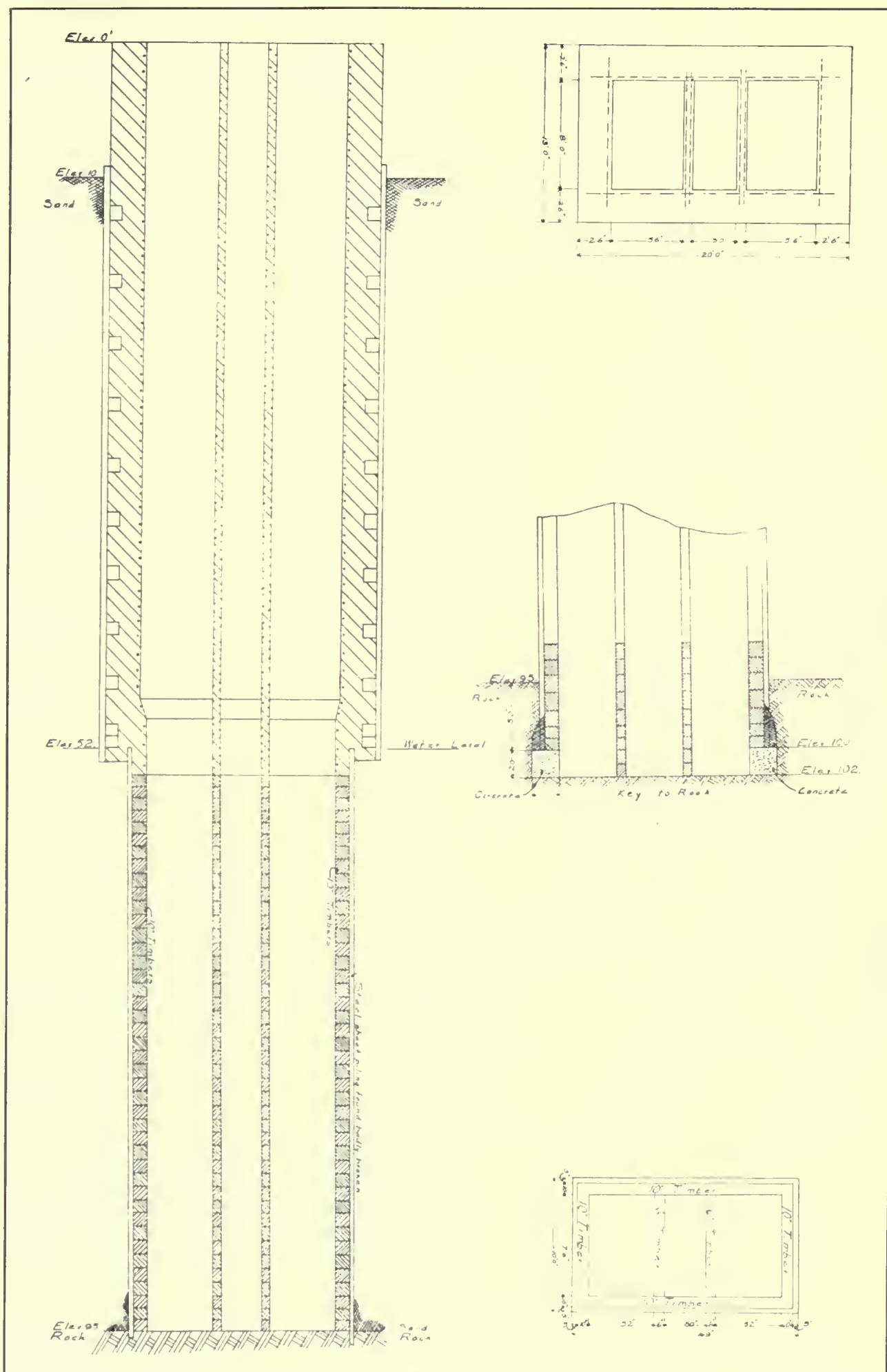
The work of excavating the shaft and lining the steel sheet-piles was carried on rapidly for 12 ft., although the old crib or timber lining, previously mentioned, had to be cut out and sent to the surface. All the timber lining was lowered through the air-lock and shafts from the surface, where it had previously been framed. As each stick was put in place it was suspended from the timber above it by 2½ by ½ in. iron straps 24 in. long fastened to each timber by two 7 by ¾ in. lag-screws. After ten courses of timber were suspended in this manner, an iron strap of the same dimensions (but long enough to engage ten sticks of timber instead of one), was fastened to the wall in the same manner and the upper end of the roof-bolt as a necessary precaution.

The size of the finished shaft inside of the steel sheet-piling was somewhat smaller than was anticipated, and for the first 25 ft. of this work there was a space of from 3 to 6 in. between the timber lining and the steel piling. This space was filled with rich concrete. As this had to be suspended from the roof as well as the timbers, and had to be put in from the bottom instead of the top, it was found difficult. However, the general line of the steel piling slanted toward the centre of the shaft and it was not long before the space enclosed by the piling was none too large to receive the timber lining.

At this point, 12 ft. down, it was discovered that four of the sheet-piles had landed on a boulder so as to be deflected from their course and, as they were further driven, they curled up inside the shaft in almost true circles of from 4 to 6 ft. diam. These were cut off with pneumatic tools and sinking was resumed. On account of the large space left open for the escape of air, caused by cutting out these four piles, and the peculiar nature of the ground, great difficulty was experienced from this point downward to bedrock. It was almost impossible to keep the water and quicksand low enough to get in a set of timbers. In a good many cases this could only be accomplished by the aid of jacks and an air-jet.

More steel sheet-piles were encountered as sinking progressed, piles that had broken away from the general line of the piling and had been forced into the shaft-area. Some of them had to be cut several times as the excavating and timbering proceeded. In all 143 cuts were made in the steel sheet-piles. This of course was slow work as a good many of them had to be cut 14 in. under the surface of the sand and water to allow for placing the timbers. The work was further retarded by a fire caused by the flame of a miner's candle, and by the breaking down of an air-compressor, both happening at different times, and it was not until March 12, 1907, that the bedrock was reached.

It was the intention of the contractor to stop the shaft at bedrock and, after making a tight joint with the same, turn it over to the mining company, but in reaching the bedrock it was found to be so badly broken up and seamy that it was finally decided to carry the excavation under air into the rock itself. After going



Sinking Through Bad Ground.

into the rock 12 ft., it was thought best to stop further sinking under air-pressure and finish the shaft in the open. Accordingly a tight joint was made with bedrock and air was taken off on May 10. The walls of the shaft were found to be tight and in good condition. Very little water came in, and that only in the centre of the rock bottom.

The contractors had a complete equipment of modern plant for the work, consisting of air-compressors, pneumatic tools, electric light plant, etc., besides other plant devices of which they control the patents. Very little, if any, headway could have been accomplished without these aids. The Syracuse Mining Co. was represented by C. H. Munger, general manager, and the work was done under the direction of F. W. Adgate, superintendent for the Foundation Company.

WELSH MANUFACTURE OF FUEL.—The manufacture of patent fuel is an important industry in South Wales, especially at the leading seaport towns Cardiff, Swansea, and Newport. Large quantities are exported every week from these ports, and the demand for this product is greatly on the increase. Therefore any improvement in its manufacture creates a wide interest. The old method of making the fuel into briquettes was the blending of fine particles of small coal with about 8 to 10% of pitch under steam heat and subjecting it to great compression. This has been the mode of manufacture since the inception of the industry in Wales, but now a revolution in the manufacture is at hand and the future of the trade seems to be encouraging. Patent rights for the new method have been secured in every country producing coal and manufacturing briquettes. The basis of the new manufacture is a combination plant, that admits of the use of tar instead of pitch, with heat supplied largely by means of furnace-gases instead of steam. The price of tar is about \$5.60 per ton against pitch at \$8.52 per ton, while only 5% of tar is used against 9% of pitch. The use of pitch involves great labor in handling, being a solid when not under manufacture, while tar, being always liquid, can be pumped or piped practically automatically all the way from the gas-works to the point of manufacture in the fuel works. As tar runs thinner than pitch, it coats practically every particle of coal, the mixing arrangements being as nearly perfect as possible; this affords a binder quite unequaled for the purpose. The less quantity of the binder and consequent greater compression, the less chance of expansion in the briquette under the climatic conditions to which this class of fuel is always subject. An important gain of the new process will be the distillation of tar from various oils. In the case of bituminous and semi-bituminous coals the heating process takes sufficient of the gases away to render the fuel practically smokeless. Arrangements are being made to erect a large plant at Cardiff, and also in the various coal producing districts. The new product has been supplied on trial for some time to several heat-consuming concerns with eminently satisfactory results. As a railroad fuel, especially for running express trains, it is considered by far the best of all fuels now in the market, taking efficiency and economy into account. It is claimed that the new fuel is superior to that made by the old method from every point of consideration—emitting less smoke, being less brittle, and showing greater tensile strength. Placing it on the same level in the matter of quality, the gain in manufacture, altogether apart from the utilization of by-products, the new fuel can be made at 59c. per ton cheaper than fuel made under the old conditions.

Coal Mining in California.

The United States Geological Survey, through E. W. Parker, fuel expert, reports that the total production of coal in California in 1906 was 25,290 short tons, having a spot value of \$60,710.

The large and rapid increase in the production of petroleum in California, which has grown from 4,324,484 bbl. in 1900, to 33,098,598 bbl. in 1906, and the use of this product as fuel in locomotives and in factories in the State has resulted in the suspension of operations at several of the lignite-producing properties, and in consequence the returns for 1906 show a decline in production from 77,050 short tons in 1905 to 25,290 tons in 1906, a decrease of 51,760 tons, or 67.5%. The decrease in value is in even greater proportion—from \$382,725 to \$60,710—a loss of \$322,015, or 84%; but this apparently large decrease in value was due to the fact that in 1905, as in 1904, the value of the product was seemingly large because the price of briquetted fuel at Stockton was based on the manufactured product and not on the raw fuel.

The plant at Stockton was burned in the fall of 1905 and has not been rebuilt. The value in 1906 is for the raw fuel only, as the briquetting plants of the Western Fuel Co. at Oakland, and of the Pittsburg Coal Mining Co. at Antioch, were operated on screening from the coal yards in San Francisco, and not from raw coal mined in the State.

A new briquetting plant that is now being erected at Stege by the United States Briquetting Co. is designed to combine peat with heavy California oil. The sample briquettes heretofore made are composed of 50% peat and 50% crude oil, and are intended for use as domestic fuel. The briquetting plant of the Ajax Coal Co. of San Francisco, which is mentioned in the report for 1905, was destroyed by the earthquake and fire of April, 1906, and has not been rebuilt.

The coal produced in California is lignitic or sub-bituminous and is mined in a number of widely separated fields. The chief mines are in the Mount Diablo field, in Contra Costa county, and the Corral Hollow field, in Alameda county, but small amounts are mined in Kern, Monterey, Riverside, and Siskiyou counties. Two other areas which have produced small amounts of coal are the Ione field, in Amador, and a small area near Elsinore, in Riverside county. Butte, Del Norte, Orange, Fresno, San Diego, and other counties have also produced small amounts, and some prospecting has been done in Fresno, Mendocino, Placer, Orange, and Trinity counties, but little encouragement is held out for any extensive development outside of the two fields now exploited.

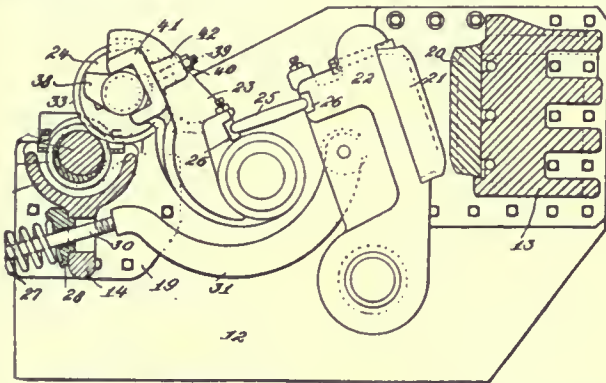
The records of the State Mining Bureau of California show a production of coal in the State as early as 1861. It was at that time one of the 15 coal-producing States. In the late sixties and seventies the annual production of California exceeded 100,000 tons, and reached a maximum of 237,000 tons in 1880. Since 1881 the production has been rather irregular, having been largely influenced by the imports of coal from Australia and British Columbia. The receipts of Australian coal have depended principally on the production of wheat and its shipments from the Pacific coast. Vessels bringing Australian coal as return cargoes have offered very low freight rates.

OXYGEN AND ACETYLENE burning in a blowpipe produce the hottest known combustion flame. The temperature is estimated at 6,300° F., 1,200° higher than the oxy-hydrogen flame and nearly equal to that of the electric arc.

MINING AND METALLURGICAL PATENTS.

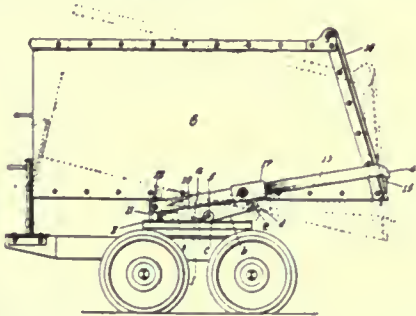
Specially Reported for the MINING AND SCIENTIFIC PRESS.

CRUSHER.—No. 859,348; Thomas L. Sturtevant, Quincy, and Thomas J. Sturtevant, Wellesley, Mass., assignors to Sturtevant Mill Company, Portland, Me., a Corporation of Maine.



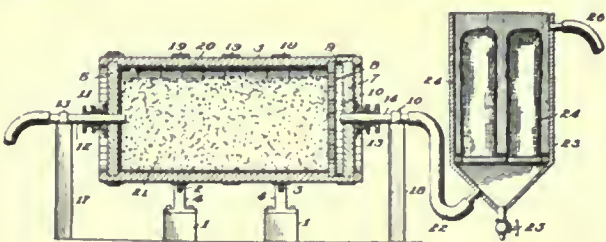
In a crusher, an operating lever having a pair of recesses, a pair of dust-proof box bearings having closed ends and mounted in said recesses, means for removably holding said bearings in position in said recesses, and a roller journaled in said bearings, the crusher frame consisting of relatively thin side plates, a head block or front cross beam, and a rear cross beam overhanging said side plates laterally and having flanges arranged within said side plates and firmly attached thereto so as to brace said side plates, combined with a driving shaft, the bearings of which are supported by said rear cross beam whereby said relatively thin side plates are relieved from the direct strain of the driving shaft, and a vibrating crushing jaw operated from said driving shaft.

COMPOUND DUMPING-HINGE AND AUTOMATIC DOOR-BAR FOR ORE-CARS.—No. 860,817; Walter C. Matteson, Stockton, California.



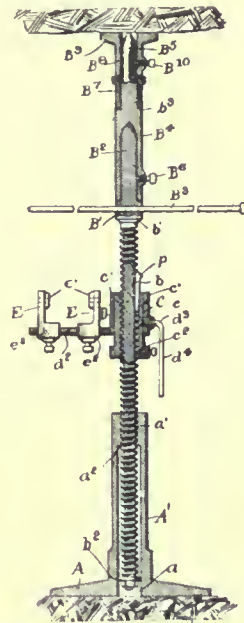
In a device of the character described a compound hinge disposed between the turn-table and body of an ore-car, and straight bars pivotally mounted to said hinge, and provided with hooks adapted to engage with the door catches of the car.

METHOD OF DEPOSITING AND RECOVERING METALS.—No. 860,661; Wilbur A. Hendryx, Denver, Colorado.



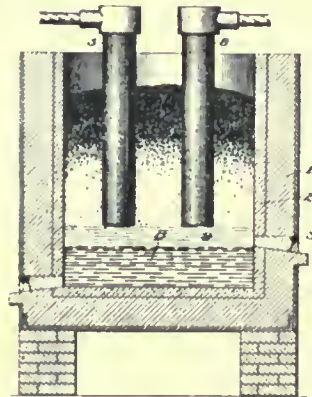
The method of depositing and recovering metals, which consists in passing a stream of metal-bearing solution through a granular precipitating agent, agitating said precipitating agent and thereby separating the metallic deposit, and providing clean surfaces for further deposition, transporting the separated deposit by said stream, and collecting the deposit.

COAL-MINING DRILL POST.—No. 858,217; Paul Rommes, Pittsburg, Kansas.



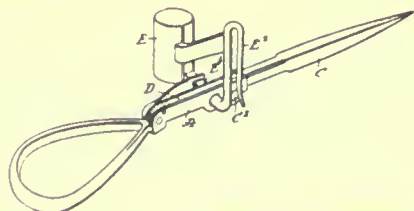
In a coal-drilling machine, a supporting post, means for anchoring the same at its upper and lower ends, an adjustable arm carried by said post, brackets slidably mounted on said arm, and a threaded box and auger shaft supported by said brackets.

PROCESS OF PRODUCING FERROSILICON.—No. 861,224; Edgar F. Price, Niagara Falls, New York.



The process of producing ferrosilicon by smelting an electrically conductive charge of a silicon compound, carbon, and a source of iron, which consists in establishing an electric arc within the charge, surrounding the zone of reduction, and protecting the electrodes from the oxidizing and cooling effect of the atmosphere by a considerable body of the charge, and maintaining between the electrodes the minimum potential difference requisite to effect reduction, thereby substantially preventing loss of electric current by leakage through the charge and heat radiation.

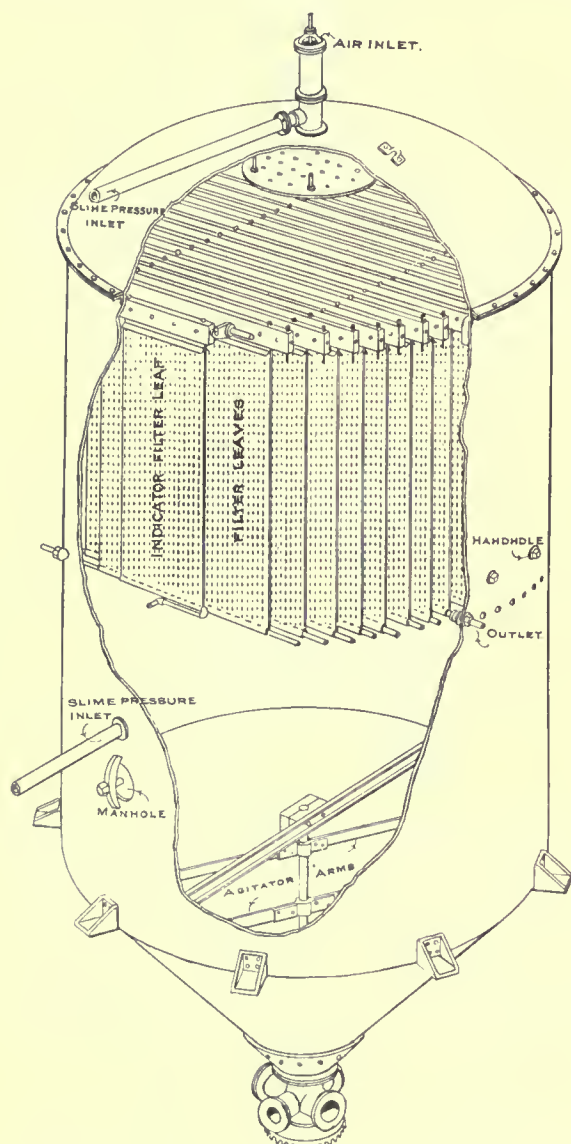
MINERS' CANDLESTICK.—No. 859,672; Henry Laukka, Virginia, Minn., assignor to Otto A. Poirier, Virginia, Minnesota.



A miners' candlestick comprising a shank having a handle at one end and a point on the other end, a candle holder having an angular stem formed with a polygonal portion engaging a correspondingly shaped seat on the said shank, and a spring connected to the shank, and bearing on the said stem to hold the stem to its seat.

The Blaisdell Pressure Filter.

The accompanying cut shows the Blaisdell Pressure Filter, for the treatment of slime or the fine portion of mill-pulp. The filter consists of three parts; a series of filter leaves; a pressure cylinder, and pumps for vacuum, slime, water, and solution. The illustration shows the pressure cylinder and the filter leaves contained within it. This cylinder is of steel, designed to withstand a pressure of 50 lb. per sq. in. In erecting, this cylinder is placed on end and is supported by iron columns or masonry. The leaves are suspended in the cylinder, each leaf consisting of a series of non-porous columns, vertically grooved with narrow drainage channels, covered on all sides with canvas. The outlet from the leaf is at the lowest point. The charging of the cylinder is accomplished from a slime-storage tank by gravity, and the pressure is maintained by a small pump, another small centrifugal pump being required to maintain the pressure of the solution and wash-water. The process



BLAISDELL PRESSURE FILTER.

of dewatering mill-pulp is continuous. Slime thickened in cone classifiers is fed into the cylinder, and, at a pressure of 25 to 50 lb. on the liquid in the cylinder, the clear water or solution is rapidly forced into the interior of the filter leaves, the slime remaining as a cake on the outside. The process is carried on without interrupting the flow of slime to the pressure cylinder. As soon as a cake of sufficient thickness is formed, clear water under a greater pressure than exists within the cylinder is admitted into the interior of the leaves in groups, causing the cake to fall through the slime to the bottom of the cylinder, whence it is discharged from time to time, and forced to the agitation vats.

In recovering gold-bearing cyanide solution from slime,

the clear solution is filtered into the leaves and goes to the precipitation vats. As soon as a cake about two inches thick has formed on the leaves, the supply of slime is cut off and the surplus returned to the sump-tank. The pressure cylinder is then filled with a wash solution, which is forced through the leaves. While transfers of liquids are being made, the cake is held in place by a partial vacuum. To remove the valueless cake from the filter, clear water at a low pressure is admitted to the interior of the leaves, causing the cake to fall to the bottom of the cylinder, where it is discharged. This company is building one of these filters with a capacity of 500 tons of slime per day.

Catalogues Received.

THE DRILL HOLE is the title of a new magazine issued monthly by the CYCLONE DRILL Co. of Orrville, Ohio. The first issue promises well.

THE BUFFALO STEAM PUMP Co., of Buffalo, N. Y., has published Catalogue No. 187, on steam and power pumps and centrifugal and turbine pumps.

THE AMERICAN ELECTRIC FURNACE Co., of New York City, has issued Bulletin No. 1, describing its induction furnace, for the production of steel by electricity.

THE COLORADO IRON WORKS Co. of Denver, has issued Catalogue No. 6—C on 'Stamp Milling Machinery.' This is an attractive catalogue, containing a brief description of the amalgamation process and an account of machinery and appliances used therein.

THE FORT WAYNE ELECTRIC WORKS, of Fort Wayne, Ind., sends us Bulletins No. 1,094, 1,095, and 1,096, concerning 'Belted Direct-Current Generators, Type LF;' 'Enclosed Alternating-Current Multiple Arc Lamps, 104-volt, Type A. C. M., Form C;' and 'Type A Transformers.'

Commercial Paragraphs.

THE COMPRESSED AIR MACHINERY Co. recently shipped two Word Brothers' drill makers and sharpeners to Goteborg, Sweden.

Adolph Hirsch, of the DIAMOND DRILL CARBON Co., of New York, has gone to Europe. From there he will go to Bahia, in Brazil.

THE KELLY FILTER PRESS Co. has been incorporated exactly a year and has made a fine start. Two 50-ton units of this filter has been sold.

THE UTAH MINING MACHINERY & SUPPLY Co., of Salt Lake City, for which J. E. Galigher is manager, is doing a good business on Callow screens for use in mills. This company has shipped these screens to every known mining country in the world. The screen is covered by patents in this as well as foreign countries.

Publications Received.

'The Forest Service.' What it is and how it deals with forest problems. Circular No. 36, U. S. Dept. of Agriculture.

'The Ballarat East Gold-Field,' No. 4, by J. W. Gregory. Memoirs of the Geological Survey of Victoria. A valuable report dealing with the celebrated 'indicators' of Ballarat.

'A Method for Calculating Steam Power Plant Economy,' by C. R. Weymouth. This deals with engine and boiler efficiency, costs, and economy, and is published by Charles C. Moore & Co. of San Francisco.

Dividend.

On August 5, the Bunker Hill & Sullivan Mining & Concentrating Company paid dividend No. 119 of \$180,000. This makes the amount of dividends paid since January 1, \$1,440,000, and the total to date \$9,306,000.

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TABLE OF CONTENTS

Editorial:	Page.
Notes.....	189
Crystals and Water in Veins.....	191
General Mining News.....	193
Special Correspondence.....	198
Denver, Colorado.....	Houghton, Michigan
Mexico City.....	Toronto, Canada
Butte, Montana.....	Salt Lake, Utah
Johannesburg, Transvaal.....	
Concentrates.....	204
Discussion:	
Slag Dam.....	F. M. Smith 205
Tube-Mills at Guanajuato.....	C. W. Van Law 205
Absurdities of Promotion.....	Aubrey L. Wisker 205
A Fundamental Problem.....	S. T. 206
Articles:	
The Relation of Ore-Deposition to Physical Condi- tions.....	Waldemar Lindgren 207
Production of Spelter.....	211
Gold Mining in Egypt.....	C. S. Herzig 212
A Broad Apex.....	214
The Uses of Copper.....	Horace J. Stevens 215
The Use and Care of Mercury.....	A Special Contributor 216
Quarry Work.....	219
The Goodman Locomotive.....	219
The United States Smelting, Refining & Mining Company.....	220
Mining and Metallurgical Patents.....	218
Decisions Relating to Mining.....	211
Departments:	
Personal.....	192
Market Reports.....	192
Obituary.....	192
Commercial Paragraphs.....	220
Catalogues Received.....	220
Publications Received.....	220

Editorial.

DREDGING FOR GOLD is flourishing in regions as far apart and as unlike as possible. In the frozen lands of Alaska there is an increasing application of this form of mining and in Burma the results obtained from three dredges are so good that a fourth is under construction. We hope to see a further development in this branch of the mining industry.

THE OUTPUT OF GOLD from Rhodesia is increasing, the past half-year making a record of 292,000 ounces as against 262,000 and 197,000 ounces in the corresponding periods of 1906 and 1905 respectively. But this increase is due not to expansion of the larger mines, but almost wholly to small parties of tributers and local syndicates. The British investor finds the returns discouraging, because the companies of large capital are credited with a shrinking production.

OUR READERS will be glad to read the article on 'Gold Mining in Egypt' by Mr. C. S. Herzig, an engineer familiar with most of the goldfields of the world. It appears that "in the days of old Rameses" they dug for gold sufficiently well not to leave any rich pickings for the prospectors of today. The story told by Mr. Herzig emphasizes once more the fact that with forced labor you can work more cheaply than with up-to-date machinery and the expensive skilled labor of these days. Not that we want to see convicts or slaves in our mines; human liberty and the pursuit of happiness by all the sons of men are worth more than any gold mine. The moral is: Every *antiquit* is not a bonanza.

WE SHAKE HANDS with the editor of *The Bee*, one of the oldest papers in California. It appears that our contemporary has said some true, and therefore unpleasant, things about the Western Federation of Miners, and thereupon the threat has been made to boycott the paper. Not long ago *The Bee* got into trouble for fearless criticism of the Mine Operators Association in Colorado, finding fault with their disregard of law and defiance of government during the bad days of 1903 and 1904. As we also have found ourselves called upon to oppose lawlessness on both sides of an industrial vendetta and have therefore become unpopular among a few extremists, we sympathize with our contemporary and wish it the best of luck in the good work of independent journalism. It is the function of newspapers to form, and not to follow, public opinion; to be leaders and not servile followers of the crowd; to express the ideas and hopes of the intelligent minority, not to echo the windy clamor of the thoughtless majority. May *The Bee* prosper, and whether it feels called upon to make honey or

to sting, may both functions be used in the best interests of good citizenship.

THE JULY BULLETIN of the American Institute of Mining Engineers possesses a mortuary interest by reason of the large number of biographical notices of members deceased in 1906. Some of the engineers whose lives are briefly recorded were widely known and respected. If the mention of their names recalls a pleasant memory, an inspiring example, or a pathetic warning, it will have served a good purpose. Among them are W. A. Akers, T. S. Austin, Edgar V. Bensusan, Horace F. Brown, R. G. Hart, George L. Keener, W. S. Keyes, Stanley H. Pearce, George H. Robinson, John Stanton, Edward G. Stoiber, John P. Wetherill. In addition, two non-American, but hardly foreign, members of celebrity were Charles Lowthian Bell (England) and Richard J. Seddon (New Zealand). No single reader is likely to go through the above list without feeling a cloud passing across his horizon and to some of the travelers of the profession, possessing a wide acquaintance, this group of vanished presences will seem a great company. Technical skill, inventive genius, fine power of application, good mining judgment, metallurgical insight, business energy, inextinguishable cheerfulness, probity of purpose, and sterling character are all here typified. Nor have they been wasted. Most of these men had accomplished something; some of them have left a good example. And among so many good men we dare to pick out one name and record once more our heartfelt respect for a man of sterling honesty, good sense, and sincerity of purpose—JOHN STANTON. He had the qualities most necessary, and too often lacking, in an era of drunken prosperity and unrestrained industrial activity. The memory of such a man bears no sting; it is a bugle call in the mêlée of life.

IN MEXICO the abandoned mine workings of the Indians and Spaniards are termed *antiguas*. Modern days have seen several attempts to rehabilitate such old mines in different parts of the world. There was the Esperitu Santo in Darien where E. R. Woakes made a reputation, the great silver mines of Potosi that Arthur F. Wendt reopened, the ancient diggings of Rhodesia which lured British promoters, and the pits that led to the development of the Kolar goldfield in India. But of all romantic possibilities in mining the slag-heaps of Burma are the most attractive. According to the reports of Bewick, Moreing & Co. and Sulman & Picard, the Baudwen mines were formerly in Chinese territory, and were known as "the great silver mine situated between Pekin and Mandalay." They were worked in the fifth century, attaining a maximum production a thousand years later. The Chinese extracted the silver and allowed most of the lead to run into the slag, heaps of which are scattered over a distance of three miles in the valley of the Sterne river, a tributary of the Nam Tu. The slag has been sampled carefully and is said to assay 47 per cent in lead, 16 per cent in zinc, and 2½ ounces of silver per ton. It is estimated that 110,000 tons of such stuff is available. Smelter superintendents will smack

their lips at the idea of tackling such a sweet mass of ancient slag. It is believed that the slag can be treated for \$30 per ton, extracting 90 per cent of the lead, and that there is a profit in these dumps of about \$1,250,000. We shall be curious to see how the enterprise succeeds. It is supposed that the old mine workings do not extend below the water-level and from the pillars remaining in places there is reason to expect ore containing silver, lead, zinc, and copper—possibly an excessive metallurgical multiplicity. One pit is 800 feet in diameter and 500 feet "from the top of the hill"—a vague statement, but enough to indicate that the ancient diggers dug a goodly hole. The tropical bush has overgrown everything and accurate information will not be obtainable until the ground is cleared. This work awaits the completion of a railway 45 miles long, for the iron horse is the only sure conqueror of the waste places of the earth. This Burmese undertaking has many points of interest and we hope to obtain details at a later date.

Crystals and Water in Veins.

WALDEMAR LINDGREN has earned the goodwill of mining engineers by more than one illuminating paper upon the great subject of ore deposition and their sense of personal gratitude will be heightened by his last important contribution to geological literature. We refer to an essay on 'The Relation of Ore-Deposition to Physical Conditions', the larger part of which we publish elsewhere in this issue. It was read before the International Geological Congress in Mexico last year and subsequently published in *Economic Geology*, an excellent magazine. Many points of interest are touched upon; for instance, the occurrence of large cavities lined with a crystalline growth has puzzled miners, who know that open spaces underground tend to close, and physicists, who are aware that the tremendous pressure at great depth causes rocks to undergo deformation. The incompressibility of water has been an argument for the possibility of crevices existing deep down and the hydrostatic pressure due to gravity has been credited as a cause in keeping fissures open. Finally, a more scientific explanation has been sought in the power of crystalline growth to force the walls of veins apart. None of these suffice, but recently Mr. L. C. Graton has hit on a happier idea, namely, that the tension of an upwelling magma could open crevices and allow of crystallization of minerals dissolved in magmatic waters. These would be allied in character to the solutions forming pegmatite dikes. Thus they recall the idea we associate with Mr. J. E. Spurr's 'alaskite', a rock consisting of quartz and alkali feldspar, deposited from the residual silicious solutions, serving thereby as a link to connect quartz veins and pegmatite dikes. In this way the gold-bearing quartz lode becomes the last phase of differentiation from a magma; it is built from the attenuated solution that is left over after the basic elements have separated and solidified. Another suggestion worthy of mention is one made by Arthur L. Collins, only a few months before his assassination, when he and the writer were

admiring the beautiful crystals of calcite on quartz as seen in specimens from the Smuggler-Union mine at Telluride, Colorado. He suggested that the exquisite transparency of these crystals argued an extremely slow process of crystallization, that is, the maintenance of uniform conditions over a long period.

Undoubtedly the recognition of zones of change, or successive depths at which certain conditions obtain, has done much to promote an intelligent understanding of ore deposits. Mr. Lindgren now advances the study of the subject by actual tabulation of the minerals characterizing these successive zones, which are roughly described as superficial, shallow, and deep. The uppermost horizon is one of great economic importance by reason of the changes induced in the metallurgical complexion of orebodies; the intermediate zone is that in which most of man's digging for the metals is now in progress; it is the zone concerning which geological evidence is most nearly satisfactory; while the deep region is one that extends indefinitely downward to the barysphere or *erige tiefe*, it is brought within the sphere of human observation by erosion, and includes many lodes of gold and silver ore formed in pre-Cambrian time. How temperature and pressure have influenced the metasomatic development of minerals, their decomposition, substitution, and re-arrangement, is told clearly by Mr. Lindgren. We shall not try to add to his observations, which are summarized in a few crisp sentences. But one factor in the distribution of ore in lodes may be mentioned, and emphasized. We refer to the water zone.

It is pretty clearly ascertained, especially among mining engineers and others in daily touch with underground operations, that there is a definite layer of water, the top of which has long been known as the 'water-level.' The bottom of this zone of water has not been recognized, simply because the sinking of shafts tends artificially to depress it; for the lateral workings of a mine, by draining an adjacent area, cause the shaft to serve as a sump or well. Miners know that at a certain level they get below the maximum seepage and in large mines the pumps are placed so as to 'take up' that water. This horizon will vary just as the top of the water varies, with topography, climate, altitude, rock structure, and other conditions modifying the amount of water at the surface and penetration of it into the mine workings, that is, the lode or vein being exploited. Below the water zone the lode becomes dry, even dusty, so as to imperil the health of miners. There is no uniformity in the depth to which this water (which is derived from the surface) penetrates, for a vein may be dry when a crossing fault-fissure is full of water; nevertheless, we have ample reason to believe that the body of water penetrated by mines has a bottom, in most cases reached within 2,000 feet from the present surface, and that below it the rock is dry enough at least not to afford a vehicle for the circulation of mineral substances. Below this again we encounter the up-welling magmatic waters and thermal solutions representing a phase of igneous activity and volcanic unrest. The whole trend of recent theory is to subordinate the importance of meteoric

waters (waters due to rain and snow at the surface) in the original deposition of ore and to restrict them to the secondary but immensely important work of concentration, re-distribution, and oxidation, above and just below the water-level. Gradually the agency of magmatic waters has been forced upon the attention of students, by Vogt, Kemp, Lindgren, and Spurr, for example, until we accept the notion that the vein-forming waters ascending from below come not, even in a round-about way, from the surface but that they are a phase of magmatic differentiation. It is the old query, in another phase, whether the sea makes the volcano or volcanoes made the ocean. However that may be, we arrive at this conception, namely, that the ascending mineralizing solutions arrive within a zone, say, a mile thick, where they encounter conditions forcing precipitation and the formation of mineral aggregates constituting orebodies. Here we venture to suggest that the one great factor modifying and shaping the reactions that end in the formation of ore is the existence of a big layer, a zone (irregular in detail, but a thin sheet as compared to the size of the earth) of comparatively stagnant water, containing the oxygen, carbonic acid, and other chemicals derived at the surface, from whence it came. When the up-welling magmatic waters penetrate into the water zone we have a change—of temperature, pressure, and dilution—sufficient to explain many of the results observed within the range of human observation, which happens to reach about as far as the bottom of the water zone. We hope to see this phase of the subject discussed, especially by mining engineers and by the geologists in touch with mining operations, for to them we look for the data likely to advance the study of ore deposits.

NON-TECHNICAL PAPERS publish a good deal of drivel on technical subjects. Here is the *Success Magazine* with a tissue of absurdities concerning gold mining on the Rand. According to this blind leader of the blind, the "gold-bearing reef is forty miles in length, twenty miles in width," and "borings to a depth of 3,500 feet show gold in undiminished quantities." Again, "the rock can be worked for centuries without making a serious impression on its vast extent." We hope the *Success Magazine* will make no serious impression. As to the statements concerning the length and width of the "gold-bearing reef," we are reminded of Euclid's definition of a straight line, that it has length without breadth, and *lies* evenly between its extreme points. Then follows some balderdash about dredging for gold in California, in the course of which we are told that "the dredgers are grinding farms, orchards, and meadows into gold." These "gold-making" dredges are compared with the coolies who are working "the hundreds of cubic miles of gold ore in South Africa." Finally, we are informed that "Science, Invention, and the Machine have conspired to destroy the gold standard." Go to, young man. Take a cold bath, and abstain from alcoholic stimulants; take regular exercise, and avoid newspapers.

Personal.

O. B. PERRY is at Dawson.
 L. S. AUSTIN is at Salt Lake City.
 H. FOSTER BAIN is at Garland, Wyoming.
 CHARLES B. LEWIS, of Nacozari, is at Los Angeles.
 CHARLES BUTTERS is at Victoria, British Columbia.
 J. F. HALLORAN has returned from a tour in Europe.
 PERCY KENYON is on his way from London to Mexico.
 CLAUDE T. RICE has returned to Butte from New York.
 A. C. LUCK has gone from San Francisco to the City of Mexico.

HAROLD WILSON is at Eureka, in San Juan county, Colorado.

GEORGE W. MAYNARD has been examining placer mines in Oregon.

JOHN B. FARISH was in San Francisco this week, on his way to Mexico.

C. F. HUMPHREY is visiting the Empire mine at Downieville, California.

GEORGE W. MYERS has returned from his annual trip to Alaska and Idaho.

ERNST HARMS is superintendent of the Torreon smelter, in Coahuila, Mexico.

J. M. PANNELL is superintendent of the San Salvador mine, at Parral, in Chihuahua.

A. MCKENZIE, of the La Reina de Plata mines, Chihuahua, is on a visit to England.

E. H. GREGORY is manager of the San Carlos mines at Mezquital del Oro, in Zacatecas, Mexico.

F. LYNWOOD GARRISON has returned to Philadelphia from another journey to Santo Domingo.

C. F. PARKER and C. J. CARROL have opened an office as mining engineers at Parral, Chihuahua.

H. P. GORDON, mill superintendent at the Cræsus mine, nearly Hailey, Idaho, is at his home in Oakland.

F. M. PERKINS is now metallurgist for the Williams & Hammer smelter at Magdalena, in Oaxaca, Mexico.

S. H. BROCKUNIER has been appointed manager for the Green Mountain Mining Co., at Silverton, Colorado.

WILLIAM DEMPSTER, of J. S. MacArthur & Co., Glasgow, has reached the Fresno Copper Co.'s mine in California.

A. E. SMITH, lately on the East Rand, is mechanical engineer for the El Oro Mining & Railway Co. at El Oro, Mexico.

W. J. FARAGUT, assistant manager of the Dolores mine, is recovering from rheumatism at the Santa Rosalia Hot Springs, Chihuahua.

W. J. CHALMERS has taken permanent quarters in the Commercial National Bank Bdg., corner of Clark and Adams St., Chicago.

ERNST FAHRIG, of Philadelphia, and his pack train passed Beaver Dam, 40 miles out of Valdez, for the interior on July 25. Dr. Fahrig is assisted by Frank H. Fahrig (his son), E. J. Sachs, and C. E. Hill; they are examining copper and gold property for English capitalists.

Obituary.

WILLIAM HENRY RICKARD died at Redruth, Cornwall, on July 17, 1907, at the age of 71 years. He was the second son of Captain James Rickard and younger brother of Thomas Rickard, now living at London. For more than thirty years he was manager of the mines and smelter at Pontgibaud, in the Puy de Dome, France. When operations ceased at Pontgibaud about ten years ago, he retired, living first in London and then in Cornwall, the home of his forefathers. A capable mine manager, a skilled metallurgist, a truly Christian man, and a good citizen in both of the countries in which he spent his life, he leaves an honorable memory and a fine example.

Latest Market Reports.

LOCAL METAL PRICES—Aug. 15.

Antimony.....	17.00@20.00c	Quicksilver (flask).....	\$38@39.50
Copper.....	24.00@25.00c	Spelter.....	7.25@ 8.00c
Pig Lead.....	5.35@ 6.30c	Tin.....	42.75@44.25c

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.				
Date	Electrolytic Copper	Lead	Spelter	Silver
Aug. 2.....	19 $\frac{1}{4}$	5 $\frac{1}{4}$	5.85	69 $\frac{3}{4}$
" 3.....	19 $\frac{1}{2}$	5 $\frac{1}{4}$	5.85	69 $\frac{3}{4}$
" 4.....	Sunday. No market.			
" 5.....	19 $\frac{1}{2}$	5 $\frac{1}{4}$	5.85	69 $\frac{3}{4}$
" 6.....	19 $\frac{1}{4}$	5 $\frac{1}{4}$	5.85	69 $\frac{3}{4}$
" 7.....	19 $\frac{1}{4}$	5 $\frac{1}{4}$	5.85	69 $\frac{3}{4}$
" 8.....	19 $\frac{1}{4}$	5 $\frac{1}{4}$	5.85	69 $\frac{3}{4}$
" 9.....	18 $\frac{3}{4}$	5 $\frac{1}{4}$	5.85	69
" 10.....	18 $\frac{3}{4}$	5 $\frac{1}{4}$	5.85	68 $\frac{3}{4}$
" 11.....	Sunday. No market.			
" 12.....	18 $\frac{3}{4}$	5 $\frac{1}{4}$	5.85	68
" 13.....	18 $\frac{1}{4}$	5 $\frac{1}{4}$	5.78	67 $\frac{3}{4}$
" 14.....	18 $\frac{1}{4}$	5 $\frac{1}{4}$	5.78	67 $\frac{3}{4}$
" 15.....	18 $\frac{1}{4}$	5 $\frac{1}{4}$	5.78	.....

COMSTOCK SHARES. SAN FRANCISCO.

Closing Prices.		Closing Prices.	
Aug. 14.		Aug. 14.	
Alpha.....	08	Julia.....	07
Andes.....	18	Kentuck.....	10
Belcher.....	20	Mexican.....	56
Best & Belcher.....	80	North Gould & Curry.....	.....
Bullion.....	15	Occidental.....	25
Caledonia.....	32	Ophir.....	96
Challenge Con.....	20	Overman.....	12
Chollar.....	06	Savage.....	56
Confidence.....	70	Scorpion.....	08
Con. Virginia.....	74	Sierra Nevada.....	24
Crown Point.....	25	Silver Hill.....	62
Exchequer.....	36	Standard Con.....	.....
Gould & Curry.....	21	Union Con.....	33
Hale & Norcross.....	59	Yellow Jacket.....	95

CALIFORNIA—Closing Quotations, Aug. 14.

Argonaut.....	4.00
Crackerjack.....	40
Extension Mountain Copper.....	1.70
Southern Belle.....	38

SOUTHERN NEVADA STOCKS.

San Francisco, Aug. 15.

Atlanta	8	57	Laguna	1.25
Belmont	3.00		Little Tonopah	1.50
Columbia Mtn	59		Manhattan Con.	45
Combination Fraction	2.10		Midway	74
Daisy	1.57		Mizpah Extension	20
Fairview Eagle	1.40		Mohawk	16.00
Florence	5.60		Montana Tonopah	3.00
Gold Bar (Bullfrog)			Nevada Hills	5.70
Gold Bar (Goldfield)	62		Red Top	3.80
Goldfield Con.	7.65		Sandstorm	45
Goldfield of Nevada	1.45		Silver Pick	57
Gold Kewanas	77		St. Ives	88
Great Bend	68		Tonopah Extension	1.40
Jim Butler	82		Tonopah of Nevada	12.00
Jumbo	3.80		Tramp Con.	35
Jumbo Extension	1.82		West End	60

(By courtesy of W. C. Ralston, 368 Bush St.)

(By courtesy of W. C. Ralston, 368 Bush St.)

COPPER SHARES—BOSTON.

Closing prices.		Closing prices.	
Aug. 15.		Aug. 15.	
Name of company.		Name of company.	
Adventure.....	21 $\frac{1}{2}$	Michigan.....	11 $\frac{1}{4}$
Ahmeek.....	.....	Mohawk.....	67
Allouez.....	32	Nevada Con.....	10 $\frac{1}{2}$
Amalgamated.....	69 $\frac{3}{8}$	North Butte.....	62 $\frac{1}{4}$
Arcadian.....	41 $\frac{1}{2}$	Old Dominion.....	28 $\frac{1}{4}$
Atlantic.....	9 $\frac{1}{4}$	Osceola.....	101
Balaklala.....	6 $\frac{1}{2}$	Parrot.....	13 $\frac{1}{4}$
Bingham Con.....	10	Phoenix.....	1
Boston Con.....	19	Quincy.....	95
Butte Coalition.....	.....	Raven.....	1
Calumet & Arizona.....	118	Rhode Island.....	3 $\frac{3}{4}$
Calumet & Hecla.....	725	Santa Fe.....	21 $\frac{1}{4}$
Centennial.....	20	Shannon.....	12 $\frac{1}{4}$
Con. Mercur.....	39	Superior & Pittsburg.....	13
Copper Range.....	62 $\frac{1}{2}$	Tamarack.....	80
Daly-West.....	13 $\frac{1}{2}$	Trinity.....	13 $\frac{1}{2}$
Franklin.....	91 $\frac{1}{2}$	United Copper com.....	.....
Grauby.....	.....	Utah Copper.....	37
Greene-Canaan, etc.....	11 $\frac{1}{2}$	Victoria.....	51 $\frac{1}{2}$
Isle Royal.....	13 $\frac{1}{2}$	Winona.....	5
Mass.....	4 $\frac{1}{4}$	Wolverine.....	144

(By courtesy of E. F. Hutton & Co., 490 California St.)

General Mining News.

ALASKA.

Some good-looking quartz has been brought to Fairbanks from the Innoko by J. T. Smeaton. The ore came from the Mike Rockley claim on Tom Gaines creek. The placer claims on the same creek are producing well. Supplies and men continue to pour into the district, and about 2,000 men are already on the ground.—A rush is on from Haines to the Chilkat district, where an Indian struck some rich quartz.—The first payment on the option on the Sheep Creek properties has been made by W. J. Sutherland, representing the Northwest Mining Syndicate. A crew of men, under G. P. Blair, will soon start work on the properties.

At Juneau, the Alaska-Perseverance M. Co. is dropping 50 stamps and will shortly install an additional 50, for which new equipment is on the ground. Considerable activity in and around Silver Bow basin is being manifested, and numerous new projects are being planned.—At Treadwell the recent installation of oil tanks along the Gastineau channel on the works of the Alaska-Treadwell G. M. Co. are the most striking objects that arrest the visitor's attention on approaching Douglas island. It is expected that all the stamp-mills will be operated by fuel oil in a short time, and each mill will have its own separate plant.—At Nevada Creek, the Alaska Treasure M. Co., operating near Juneau, expects to start up its new 20-stamp mill some time this fall on good ore. This mine is on Douglas island south of the Treadwell properties. F. M. Stone is the manager and M. S. Hudson the superintendent.—The smelter at Hadley has been closed down, due to lack of fuel, but has resumed operations again.

ALABAMA.

TALLAPOOSA COUNTY.

The Silver Hill mine has been cleaned out and examined by Birmingham capitalists. This is an old property that is reported to have produced rich ore.

ARIZONA.

COCHISE COUNTY.

The feature of the last week in mining circles at Bisbee has been the strike of ore on the 1,100-ft. level of the Denn-Arizona property. This ore was struck a few months ago on the 1,000-ft. level and a drift on this level was in ore for 55 ft.—The Copper Queen Co. is considering the advisability of using small electrically driven pumps to handle the normal flow of water, retaining the heavy ones at present in use for the increased flow during the rainy season. Also, there is a new plan under advisement for a centralized haulage and hoisting scheme, with all the working drifts converging toward the Sacramento shaft, which will be the central point of the new system.—At the Czar shaft of the Copper Queen the work of widening the pump-column compartments is finished, with the exception of a little work on the stations, and the new wood-lined pump is working satisfactorily at the Holbrook. At the Cuprite shaft drifts are being run in various directions, but no strike of importance has been made. Work at the Calumet & Arizona smelter at Douglas is progressing, the new power-house steel frame is complete, the new blower and engine and 500-kw. electric unit new condenser and circulating pumps have been placed on their foundations. The ore shipments from the mine exceed the capacity of the four furnaces in operation, and the stock-pile at the smelter is growing.—The relay-pump station on the 1,200-ft. level of the Junction shaft of the Superior & Pittsburg has been timbered, and will soon be ready for the pumps. Stoping continues on the 900 level, and the orebody found on the 1,000 level will be developed as soon as the pumps are working. Drifts have been started north, east, and south from the Hootson shaft, and stoping has been started on the 1,100-ft. level. Shipments from the Cole shaft are increasing.—The new compressor of the Shattuck-Arizona will be in operation this month. Toward the end of July this company was producing 400 tons per day, 200 tons of sulphide ore going to Globe, and

200 tons of oxide ore to the Copper Queen smelter. The east extension of the drift on the 900-ft. level is still in ore running about 4%, and the south extension has been driven about 175 ft.—During the last month the Bisbee Extension Co., operating six miles west of the city, sunk its shaft 63 ft. in 25 working days, with two shifts. The shaft is down 375 ft. and is entering a broken limestone zone that looks favorable for ore. Prospecting on the surface along the fault 100 ft. north of the shaft shows some copper stain. An air-compressor will be installed this month.—The attempts to unionize the smeltermen at Douglas continue, but little progress is being made by the agitators.

Some good results are reported from development work on the ground of the North Bisbee Development Co., four miles north of Bisbee. Porphyry, granite, limestone, and schist all occur in that region. This company has sunk a shaft 70 ft., and has cross-cut for 15 ft. A vein has been discovered that carries copper carbonates. H. S. Jones is president and E. H. Clark superintendent.—The Copper Queen company is working on its plan for a new hoisting plant at the Sacramento shaft, out of which will be hoisted all the ore from every shaft belonging to them. To this end the large Nordberg hoist which will be used has been ordered and is being built. The system to be employed in this work is elaborate. After the drifts from the various shafts have been completed the transportation problem will be solved by a complete trolley system, for which the power-plant will furnish the current. This will be installed in a few months. The hoist will have a capacity of from 3,500 to 4,000 tons per day, although no such output as this is contemplated by the company at present.—For the purpose of making the final payment on the Minneapolis Mining Co.'s property, bonded about a year ago to Minneapolis people headed by J. W. Christy, C. I. McReynolds arrived in Douglas recently. The original owners of the property were Nihart & Wall, of Douglas. The Minneapolis group is situated near Campas and has been developed extensively since the property came into the hands of the present owners. Ore has been opened up and regular shipments are being made to the smelters. At the new C. Q. power-plant the first equipment will not be large, but both building and equipment will be enlarged to meet the demands of the mines. The initial machinery equipment will consist of three turbo-generators and three air-compressors. An oil storage tank with a capacity of 200,000 gal. near the same place is now nearing completion and will be ready for use shortly.—A good strike is reported to have been made at the Hershall mine at Tombstone. A vein 10 to 18 in. wide was struck 35 ft. below the 350-ft. level, which shows horn silver and gold.—During the past few weeks new strikes have been made in the Dragoon Mtn., about 20 miles east of Benson; in the Rincon Mtn., north of Benson, on two different properties; on the Catalina Mtn., just north of the Rincon Mtn. and in the Whetstone Mtn. about 20 miles southwest of Benson. During this time several new camps have been established.

SANTA CRUZ COUNTY.

(Special Correspondence).—C. A. Overlook, manager for the Arizona M. & T. Co., reports good results in the Los Angeles mine at Douglas. The smelter returns on the last car of ore shipped gave 12.5% copper and 46 oz. silver. Four cars of this high-grade ore was taken from the shaft, which is now only 60 ft. deep. At the bottom a drift was driven from the shaft for 12 ft. and is all in ore. Forty pack animals are carrying ore to Nacoari, eight miles away, and from 30 to 35 men are at work in and about the mine. A good wagon-road can be built to the mine from the Southern Pacific, now being graded, a distance of nine miles, but until this is done the ore will be packed to Nacoari for reduction.—It is the intention of the Two Queens company, owning gold and copper mines at Winkelman, to push development operations. Machinery has been ordered from Los Angeles, including a 25-hp. gasoline hoist, cable, ore buckets, etc. The roadway to the mines from the railroad will be in readiness for hauling the machinery upon its arrival. As to recent progress, shaft No. 1 is down 217 ft., or 60 ft. below the tunnel level, and shaft No. 4 has reached a depth of 155 ft., with a cross-cut

of 26 ft. toward the vein. This cross-cut may cut the vein at any time now.

Prescott, August 5.

YAVAPAI COUNTY.

Thomas W. Lawson of Boston now owns the Humboldt smelter near Prescott, having secured on July 9 all but 25,000 shares of the capital stock of the Consolidated Arizona Smelting Co.—David S. Rose of Milwaukee has taken over, under bond, the McDermott group of mines, in the Big Bug district. The deal is the result of a visit to the property about a month ago.

CALIFORNIA.

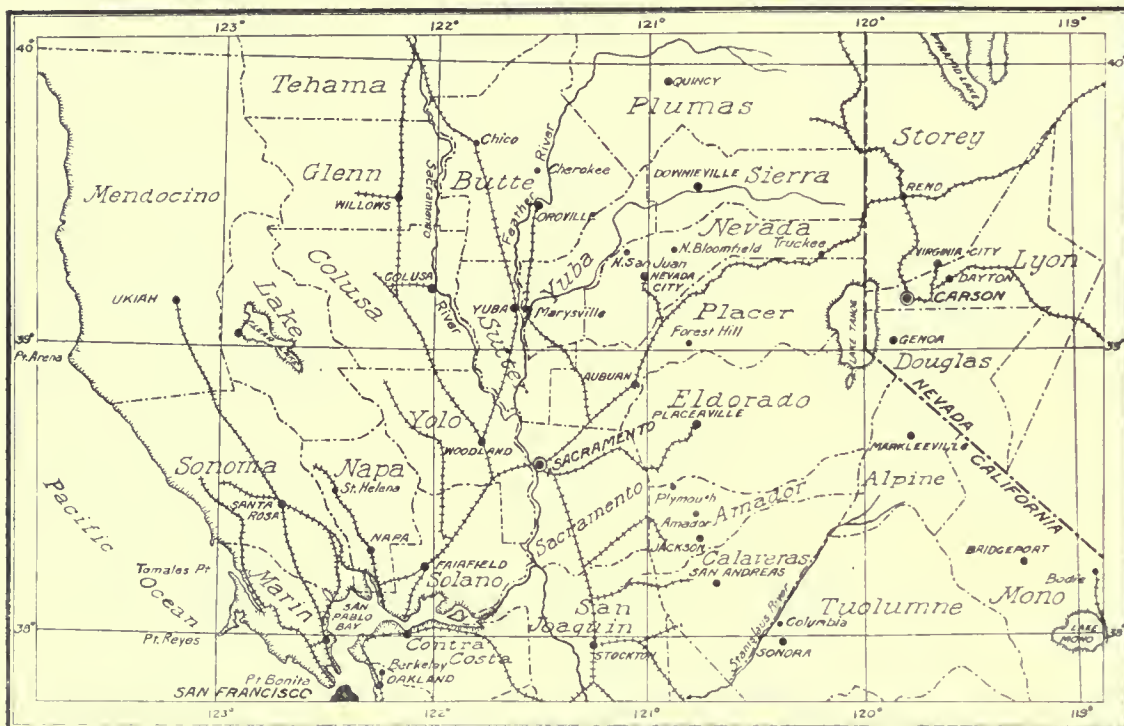
CALAVERAS COUNTY.

Conflicting reports emanate from Angels Camp, where the strike has been on for several months. It is stated that the mine-owners have offered to allow the men to return to work on a nine-hour basis, and that if they do not accept, the camp will be run on the open-shop principle. Another rumor has it that the Stanislaus Electric Power Co. has

The new mill, including ten stamps, and Wilfley concentrators, is in place, and will be running within two months. The battery foundations were built for 20 stamps, and 10 more will soon be erected. Excavating for the flume and power-house has begun and about 600 hp. can be generated. A gravity tramway 400 ft. long will be built from the tunnel to the mill. The main tunnel is in 500 ft. and 2,000 ft. of driving has been done.

NEVADA COUNTY.

A big electrical pump is being made at Taylor's foundry for the Sultana mine; it will be placed on the 800 level, and will have a capacity of 500 gal. per min. on a 2,100-ft. incline. The pump is driven by chains from the motors.—A 250-hp. Norwalk compressor is being installed at the Empire. It was formerly at the Allison ranch, and can be driven by steam or electricity, and may be used to operate the mine pumps in cases of emergency.—The work of unwatering the Kenosha is proceeding satisfactorily, and the foundations for the new Cornish pumps are completed. One pump will be placed at the 300 and one at the 500-ft.



Map of Central California.

entered into negotiations with the Utica Mining Co. for the purchase of the mining company's water-rights, flumes, ditches, pipe-lines, and power-plants. If this deal goes through, it will mean the permanent abandonment of the Utica property. The stockholders of the Lightner Mining Co. voted recently to close down that mine, and it looks as though Angels would be permanently put out of business.

EL DORADO COUNTY.

Some good indications have been encountered in the Crane Gulch mine, and this old-time producer may be again productive.—A survey of the Woodside-Eureka mine has just been completed.—A compressor will be installed at the Alpine mine, and hand work done away with.—The first level of the Taylor mine will soon be free of water and the pumps are running to their full capacity. The Thompson brothers are operating the property.—Seventy men are employed at the Eureka slate quarry and a large amount of finished roofing slate is being turned out every day.—The overburden will be hydraulicked from the veins outcropping on the Arterburn & Shultz group. A survey has been made and a pipe-line will be laid.—The main tunnel at the Cooley mine is being driven ahead to get under the centre of the channel.—Sinking continues on the Blue Rock mine, but pumps will have to be installed, as some water has been encountered.

INYO COUNTY.

Fifty men are employed at the Casa Diablo property.

levels.—Work has been resumed at the Union Hill mine, on the line of the Nevada county narrow gauge railroad, two miles from Grass Valley. The property has been idle for 15 months, but now the pumps are working and the mill has been running for a week. L. P. Doe of San Mateo is financing the work.—At the Banner mine the 700-ft. station has been reached in unwatering the shaft, and the Knowles station pump at that point has been started to help the sinkers.—The Murchie, Charonnat Union, and Murchie Extension properties in the same belt with the Empire, are attracting attention.—J. S. Goodwin and associates will erect a hoist on the blue lead gravel mine near You Bet, preparatory to building a well to work on the cement gravel.

SHASTA COUNTY.

A diamond-drill outfit is being hauled to the Sugar Loaf mine from Coply. This property is being developed by Fillins, Grotefiend & King, who employ about 40 men.—The Shasta-Kennett Copper Co., of which Martin Lindley is president, is operating in a small way one-half mile northeast of Kennett. A tunnel has been run 600 ft. during the past year.—The diamond-drill for the Vulcan Copper M. Co. has arrived at Kennett and will be shipped to the mine at once. The drill was made by the Sullivan people and has a capacity of 1,000 ft., with a core about one inch in diameter. Dan Longton will operate the machine.—The Heroult iron smelter is now in regular operation, after a delay

caused by charging the voltage of the apparatus.—Development work at the Summit mine is being rapidly pushed. Tunnel No. 3 is in 400 ft., following a contact of rhyolite flows and the gouge carries a little gold and copper. Tunnel No. 2 is in 300 ft. and a raise has been run 50 ft. A small air-compressor is driven by a 50-hp. Westinghouse motor.—A strike is reported in the Ten Lakes mine, west of Edgewood, which is being developed by the Osborne brothers.

SISKIYOU COUNTY.

The Humboldt-Siskiyou company has been organized to work a quartz vein three miles from Callahans. H. Hersey is the superintendent. J. K. Firth, of the Allis-Chalmers company, has got the contract for a 10-stamp mill.—A new dredge is to be built on the south fork of Scott river at Callahans, having been contracted for by the Risdon Iron Works.—A new electric pump has been installed at the Sheba mine on Patterson creek, in Scott valley.—J. H. Morrison, of Quartz valley, has sunk an incline shaft on the Luke Shaw vein for 100 ft. Some good milling ore is being developed in F. H. Osgood's mine on Taylor creek.—The Holman-Foskett company is employing 20 men at their mine in White's gulch, near Snowden.

IDAHO.

SHOSHONE COUNTY.

The Bunker Hill & Sullivan Co. is shipping between 8,000 and 9,000 tons of ore daily, and is working a force of 500 men in the mine. The entire body in which they are working is of high grade, assaying 55% lead and about 19 oz. silver, and about 10 cars of ore per day have been shipped. The company has been forced to dump ore for a time in the yards because of not having ears enough to load, as it is usually supplied with about 50% of the cars required. At one time last season there was \$200,000 worth of concentrate heaped in the yards waiting to be loaded for shipment to the smelter.—The last dividend of \$180,000 was paid August 4; dividends have been paid at the rate of \$1,340,000 a year, and are soon to be increased because of the enlarged and improved milling facilities.—The C. E. Mitchell Co. of Spokane, operating the East Snowstorm extension at Mullan, has ordered machinery for sinking a double-compartment shaft. The decision to sink the shaft was reached after a conference between officials of the company and John M. Scrafford, manager of the property. Power will be supplied by the Washington Water Power Co. of Spokane, which recently completed its line to within a short distance of the property. The company expects to be shipping ore before they have reached the bottom of this 200-ft. shaft, as they have been working along the hanging wall and have cross-cut 112 ft. without striking the foot-wall, and a 20-ft. prospecting shaft showed shipping ore. Twelve inches of bornite ore, carrying native silver, is the latest strike reported from the Snowstorm mine at Mullan. The strike was made in the lowest level in the property. The drift for more than 100 ft. had been in copper ore, the vein being wide. The Snowstorm ore has always carried silver, but not in commercial value. The extent of the vein has not yet been ascertained.—The Little Pittsburg on Pine creek in the Cœur d'Alene is coming to the front since it was taken under bond by S. P. Williamson. A cross-cut has been started from a point near the face of the main tunnel, designed to cut the main vein, which is stripped on the surface. It is believed this cross-cut will have to be run a distance of 1,100 ft. to cut the lode. The depth of the ore-shoot will be 250 ft. The vein on the surface is 11 ft. wide, and has been stripped nearly the entire length of the claim. Indications of a large orebody are evident at 1,100 ft. The main tunnel is now in 350 ft. A cross-cut was run 240 ft. from the mouth of the tunnel. This shoot was two and one-half feet wide. Assays from it returned as high as 70% lead, 22 oz. silver, and 12% zinc.—The entire Cœur d'Alene country is looking better than it has for years. The 200-ton mill that is being installed at the Stewart will be completed soon and ready to begin milling. The mine is shipping 15 car-loads per week of commercial ore, which is marketable without being milled, working a shift of 15 men. Everything is in first-class condition.—At the Oom Paul a shaft

has been sunk 500 ft., and they are driving from each side of the shaft and expect to strike the ore-shoot in a short time.—Articles of incorporation of the Clearwater Gold & Copper Mining Co., have been filed in Wallace, which is designated as the principal place of business and the company is capitalized at \$2,500,000, divided into 500,000 \$5 shares. The incorporators and directors for the first year are Michael Steffans and John H. Wourns of Wallace, and Samuel Seidenfeld of Spokane. The entire capital stock of the company has been subscribed by the incorporators. The company was formed to develop the Morning Star, Morning Star Fraction, Evening Star, North Star, and Golden Dollar lode claims, and the Old Crow, New Idea, and Q. S. placer claims, all situated on the north fork of the Clearwater river 18 miles from the Amador mine, in Shoshone county.—Mayo Sachs & Co. of Butte, have made the final payment of \$25,215 on the purchase of the controlling interest in the Alameda mine. The drift is now 42 ft. inside of Alameda ground, and they expect to complete the 100-ft. contract by August 15 and will then start cross-cutting north and south for the contact veins which are known to exist from the work in the Alameda tunnel 300 ft. above the present workings. There is no ore in the face of the tunnel, the orebody being to the south, but they expect to reach it by cross-cutting.

NEVADA.

CHURCHILL COUNTY.

(Special Correspondence).—The shaft on the Belle-Hellen is down 75 ft. and cross-cutting from the bottom of the shaft is under way. Some good ore is in sight.—The Daisy Wonder shaft is down 160 ft. in good ore. The shaft is equipped with a 25-hp. gasoline hoist.—A 6-ft. vein has been encountered in Tunnel No. 5 on the Nevada Hills. A hoist has been installed. 1,000 sacks of ore are at the mine and the chutes are full.—A vein has been struck in the bottom of the Fairview Eagle shaft at a depth of 218 ft. A flow of water was also struck, which compelled the bulk-heading of the drift and suspension of operations until a pump can be installed.—The Spider-Wasp Extension shaft is down 50 ft. and will be sunk to the vein.—The tunnel in the Vulture is in 650 ft. and some fair ore has been found.—The shaft at the Imperial Wonder is down 70 ft. A 15-hp. hoist is being installed.—A shoot of ore was recently found in the lower levels of the Jackpot, and development work is under way.—At the National Wonder, the shaft is down 65 ft. in ore. This mine adjoins the Jackpot and is controlled by the same company.

Fairview, Aug. 6.

ESMERALDA COUNTY.

During the week ending August 10, the ore from the mines at Goldfield was disposed of as follows: Shipped to smelters, 575 tons; shipped to mill, 2,584; and treated at Combination mill, 450. Total output, 3,709 tons, of an estimated gross value of \$400,000. This output and value are below those of the previous week, when the Mohawk and Combination mines made extra shipments of high-grade ore. Small shipments were made for the first time from Mohawk Ledge and Rogers Goldfield Syndicate properties.—During this week the Nevada Goldfield Reduction Works received consignments of ore as follows: Mohawk Florence, 390 tons; Mohawk Jumbo, 326; Mohawk Combination, 693; Red Top, 270; Mohawk, 453; Little Florence, 34; Frances Mohawk, 91; Higginson lease, 95; May Queen, 9; McNaughton lease, 68; Rogers Goldfield Syndicate, 25; Hayes-Monnette dump, 130.—A new lease on the Miss Jessie claim of the Red Top company has been given to J. H. McMillan and George B. Holleran. A three-compartment shaft is down 185 ft., a head-frame is being built, and the 75-hp. gasoline hoist from the Frances Mohawk No. 1 lease will be used.—A diamond-drill will be placed in the bottom of shaft No. 7 on the White Rock claim of the Begoles Mines Syndicate, to prospect the ground in every direction.—An extension of the lease on the Deserted claim of the Silver Pick has been granted to the Goldfield Silver Pick L. Co. A shaft has been sunk 300 ft. and 700 ft. of driving has been done.—Reports state that the Etawanda company, operating five miles east of

Goldfield, has struck ore on the 115-ft. level.—The Congo tunnel on the Nevada Queen property is in 345 ft. and a raise has been started for the surface for ventilation. Donald Ferguson is the manager of the property. On the Pittsburgh Nevada the shaft is down 120 ft.—The shaft of the Diamondfield Red Mtn. Co. has passed the 100-ft. point.—There is good ore exposed in the winze on the 420-ft. level of the Kewanas, and some copper is coming in with depth.—It is possible that the Goldfield Consolidated, regarding the overcapitalization of which much has been written by mining men, will pay a small dividend in September.—The Mohawk Combination L. Co. will soon pay its first dividend of 10%. The company is shipping about three carloads per day, and the lease expires in about four months. Fred Siebert is in charge of the work.—An English syndicate has taken a lease on the Grandma ground and has started diamond-drilling. A steel head-frame and 100-hp. hoist will be erected and sinking started.

HUMBOLDT COUNTY.

(Special Correspondence).—Since the reopening of the Glasgow and Western Exploration Co.'s reduction works, this town is enjoying some of its oldtime prosperity. The Gold Run district is coming to the front. The principal properties are the Adelaide, Georgianic, Florence, Gold Reef, and Great Republic.—The shaft on the Adelaide is down 300 ft. and 70 tons of ore are treated daily at the reduction works.—A 50-ft. shaft and numerous prospect holes have disclosed some ore in the Georgianic.—On the Florence several small shafts have been sunk, and open-cuts have exposed the vein.—On the Gold Reef, four shallow shafts have exposed small veins carrying gold and silver.—The Great Republic has a good record as a producer, and the main vein is stripped for 2,000 ft. The ore is lead-silver.

Golconda, Aug. 7.

LYON COUNTY.

The Nevada Mammoth G. M. Co. owns 26 claims in the old Cambridge district, 28 miles south of Yerington. Eastern investors have recently bought a large block of the stock and a valuable water-right on the east Walker river will be purchased.—A carload of copper ore has been shipped from the mine of the Union Blue company.—The shaft of the Wabuska Copper Co. is down 100 ft. and a cross-cut will be driven to the vein.—From Ramsey comes the report of a strike in the Walkover mine.

The Ramsey-Comstock mine has commenced shipping ore to the Utah smelters. The hanging wall ore-shoot has been driven on at the second and third levels for a distance of 150 ft., and the ore extracted has been sacked for shipment. They have started a stope from the second to the third level, and continue driving. Near the east end-line of the Ramsey-Comstock ground, the Ramsey-Ophir Mining Co. is developing the same vein. A raise of 60 ft. from the tunnel level is well started and sinking will commence as soon as it is finished. They have found some ore in the vein and will sink as deep as the adjoining mine, on the hanging wall, where the rich shoot occurs.—The Walkover Mining Co. has commenced sinking on its ground west of the Comstock. They have a hoist and will develop the vein that was exposed with a tunnel 25 ft. from the surface. Some ore is piled on the dump. The Ramsey-Bonanza company will soon install a gasoline hoist, gallows frame, etc. They are to continue sinking the two-compartment shaft to develop the vein.—The Ramsey Consolidated Co. will sink on their four-foot vein on Dago No. 1 claim. The cross-cut from the 300-ft. level on Dago No. 2 claim is in 18 ft.—The Ramsey-Goldfield M. & R. Co. will sink on the hanging wall of their vein, the west extension of the Ramsey-Comstock. A vein has been exposed and a hoist will be erected.—Several thousand feet of workings are opened up at the old Garavanta mine, and the owners are steadily increasing the extent. They are getting ready for a mill and improved machinery.—George Wingfield, H. T. Bragdon, and several other Goldfield men are making ready to develop the Red Mountain dike, southwest of the Ramsey-Comstock.

NYE COUNTY.

(Special Correspondence).—A vein has been found in the 1,250 level in the North Star. Ore has also been struck in the 950 and 1,050-ft. levels.—Ore is being developed in the 800 level in the Midway, and a raise is under way from the fourth to the third level.—Some good ore has been found in the Jim Butler, in the lower levels.—The shaft of the Mizpah Extension has been repaired and re-timbered to the 600-ft. level, and a 50-hp. hoist installed. Ore is being developed on the 500 level.—The Tonopah Extension is developing an orebody on the 1,050 level. It is reported that the ore will be treated at the Montgomery-Shoshone plant at Bullfrog.—The hoists and fittings of the Ohio shaft on the West End are being transferred to the new shaft, which is being sunk to connect with the lower workings. Good ore is being exposed.—It is announced that the Tonopah Standard will be re-opened and the shaft put down to the 1,000 level.—Small shoots of promising ore have been struck in the Tonopah Buckeye. The shaft is down 125 ft.—A large force of men are engaged in developing the lower levels of the Tonopah, and much virgin territory has been opened up. The mine was recently inspected by J. W. Brock.—At the Mizpah good ore is being extracted, and driving is under way.—The Union district is attracting attention by reason of strikes made in the Berlin, North Butte, and others. Ore running well is said to have been found on the Richmond claim of the Berlin. The lease is operated by Kendall & Douglass, who are employing a large force of men.—Several placers are being operated in the Walker Reservation, and some nuggets have been found.

Tonopah, Aug. 9.

The 40-stamp mill of the Montana Tonopah is complete, and will commence dropping its stamps this month. It will run at half capacity at first, due to the lack of power. To remedy this it will be necessary to divert all the power from the mine to the mill, running the hoist and compressor with steam. The Hendryx system of agitation will be used in the cyaniding department. A. P. Carter will be in charge of the mill. It is claimed that \$8 ore can be treated at a profit.

NEW MEXICO.

The mining business in the Mogollon district is in better shape than it has been for many years. The Last Chance mine alone gives employment to about 90 men. The 80-ton cyaniding and concentrating mill is running full time and bullion and concentrate are shipped to Silver City. This mine, which is operated by the Ernestine Mining Co., is reported to have produced more silver last year than all the other mines of New Mexico combined. E. Craig is at the head of affairs. The mill, running on sulphide and chloride ores, saves 95% of the precious metals. J. T. Griswold is mine superintendent, and A. M. Redfern, mill superintendent. The workings extend 500 ft. below the tunnel level.—At the Deadwood mine two shafts are down 100 ft. and 240 ft., and driving and cross-cutting are going on in the lower levels: 20 men are employed.—To the west of the Last Chance is the Tip Top mine, owned by D. R. Brownell and John Coffey, on which development work is proceeding.—The Little Fannie property is closed down at present, but work is expected to start soon. The shaft is down 550 ft. and a good hoist is in place, with a capacity of 1,000 ft. This mine is worked by the Mogollon Mtn. Investment Co., promoted by W. J. Weatherby and T. J. Cooney.

OREGON.

BAKER COUNTY.

The United Elkhorn mine is a promising property, and much progress has been made the past year in the way of development, but they have been unable to do any milling for a few months past on account of the volume of water in the lower levels. This is now being overcome, and the usual production is confidently looked for.—At Sumpter, the North Pole mine of the Eastern Oregon M. Co. and the Columbia mines are working steadily with satisfactory results. All the other properties in the district are idle.—At Geiser, one of the most promising properties is the

Phoenix mine, under the management of Chas. F. Parker. The 10-stamp mill is steadily pounding on good ore, and much new development is under way. The mill at the Bonanza mine has not been running for several weeks, and it is rumored that Eastern parties have been interested, with ample capital to take over the property.

TENNESSEE.

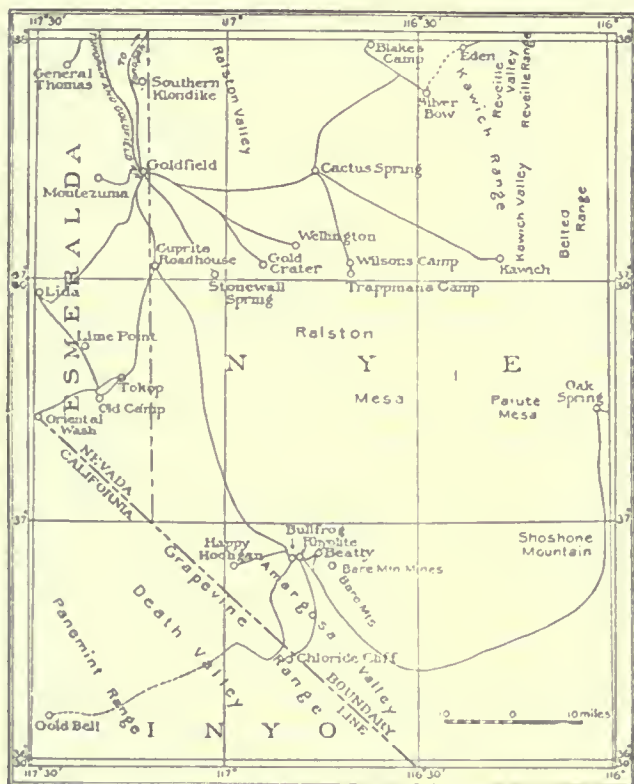
CLAIBORNE COUNTY.

(Special Correspondence).—At the mines of the Tennessee Zinc Co. a 50-ton concentrating mill is running, with an equipment of jigs and tables. A disintegrating screen has been installed to handle high-grade carbonate ore, and a flotation plant is being erected. The mine is opened by a 700-ft. tunnel, and work is carried on both above and below this level. An underground stream was found in the lower workings.

WASHINGTON.

FERRY COUNTY.

(Special Correspondence).—The cross-cut from the No. 2 adit of the Copper Key mine has intersected 53 ft. of ore, but the hanging wall is not yet in sight.—A contract has been let to drive 300 ft. of an adit by the Bortle Copper-



Part of Nevada.

Gold Co.—The Copperopolis Mining Co. is constructing two miles of wagon-road from the Last Chance, a copper-gold mine, to a point near Kellar.

Republie, Aug. 12.

OKANOGAN COUNTY.

(Special Correspondence).—John Boyd, manager for the Palmer Mountain T. & P. Co., has arrived at the mine from New York, where he has secured capital for the work in hand.—The Allen Gold M. Co. has received and is installing hydraulic machinery at the Mary Ann creek placers, near Chesaw.—The Oroville Consolidated Mines, a company operating near Oroville, has struck a body of copper ore in a shaft recently started.—Horace F. Evans, of England, is making a geological examination of the mineral districts in the northern part of Okanogan county, presumably in the interest of an English syndicate.—Ore is being shipped from the O. K. mine, on Kruger Mtn.—The Kruger Mountain M. Co. has struck a large body of good ore near Nighthawk.

Republie, Aug. 12.

STEVENS COUNTY.

(Special Correspondence).—A shaft has been sunk 65 ft.

on the Regina vein; the last 15 ft. is on copper-bearing quartz, three to four feet wide.—A contract has been let to drive 50 ft. of an adit and to sink a shaft 200 ft. on the Summit mine.—Rich gray copper ore has been struck at a depth of 20 ft. on the Copper Queen mine, near Chewelah. Republic, Aug. 12.

BRITISH COLUMBIA.

The coke shortage, curtailing the capacity of the smelters, has resulted in a decreased output from the Rossland district for the week ending August 3. The coke companies at Crow's Nest Pass claim that since the strike they have been unable to get men enough. The Northport smelter was forced to close one of its furnaces, and there is hardly enough fuel to keep the other two running. At the Granby smelter at Grand Forks three furnaces have been shut down and the fuel supply is rapidly running short. The Trail smelter is running with a small fuel reserve.—During the week the Centre Star shipped 2,440 tons; Le Roi, 2,205; Le Roi No. 2, 245; White Bear, 70 tons. Total, 4,960 tons of ore, making a total production for the year to date of 163,232 tons. The last of the War Eagle electric motor has been shipped to the Snowshoe mine at Phoenix, and the machine will be installed at once. At the Le Roi the drift on the 1,350-ft. level toward the winze workings is in 120 ft. The mine could increase its production materially if the Trail smelter could handle the ore.—The vein on the 700-ft. level of Le Roi No. 2 is showing up well with development.

At the Consolidated smelter at Trail, there were received during the week 4,449 tons of ore. Besides the Rossland shipments, other consignments were furnished as follows: Snowshoe, Phoenix, 916 tons; Victoria, Nelson, 73; St. Eugene, Moyie, 757; La Plata, Kokanee creek, 30; Lone Bachelor, 15; Lorna Doone, Silverton, 1; Vancouver, 20; Jo-Jo, Three Forks, 8; No. 1, Ainsworth, 21 tons of ore.—The Northport smelter received 2,205 tons of ore.—The shipments from southeastern British Columbia for the week were as follows: Boundary, 30,567 tons; Rossland, 4,140; East of the Columbia river, 3,025 tons. Total, 37,732 tons; for the year to date, 913,978 tons of ore. The shipments were divided among the various smelters as follows: Grand Forks, 13,709 tons; Greenwood, 10,130; Boundary Falls, 5,832; Trail, 4,449; Nelson, 253; Northport, Washington, 1,793; Marysville, 600 tons. Total, 36,766, and for the year to date 883,636 tons.—Boundary ore shipments fell off about 7,000 tons this week on account of ear shortage and freight congestion. The Granby smelter received from Granby mines 13,649 tons; from Emma, 60. The British Columbia Copper Co.'s smelter from Mother Lode, 7,040; from Snowshoe, 2,970; from Emma, 60; Mountain Rose, 60 tons. The Dominion Copper Co.'s smelter from Brooklyn, 1,664 tons; from Rawhide, 2,272; Idaho, 320; Sunset, 1,516; Mountain Rose, 60 tons. Trail smelter, from Snowshoe, 990 tons. Total shipments for week, 30,671 tons.—Boundary smelters during the week treated are as follows: Granby, 13,115 tons; B. C. Copper Co.'s smelter, 11,160; Dominion Copper Co.'s smelter, 5,842. Total for week, 30,117 tons of ore.

Diamond drilling has been resumed on the Monarch claim of the Granby company by Boyles Bros.—At the Gold Drop, an intermediate tunnel between the Curlew tunnel and the main workings is being driven by contract. This will connect with a raise from the lower tunnel.—A new syndicate has taken over the Riverside mine, near Rock creek. W. E. George is in charge of operations.—The Canadian Pacific railway reports that 100 steel dump-cars have left Montreal to be used in the ore traffic of the Boundary district.—It is planned to build two converter stands at the smelter of the Dominion Copper Co. At present the matte from Boundary Falls is being blown to blister copper at the converting plant of the B. C. Copper Co. About 100 men are employed at the Dominion Copper Co.'s Rawhide mine, and a large amount of ore has been developed.—There are more men on the payroll of the St. Eugene at Moyie, in East Kootenay, than ever before. The Lake Shore shaft is to be sunk another 100 ft., making 600 ft. in all.

Special Correspondence.

Mexico City.

The Lucky Tiger or El Tigre Litigation.—A Long Battle.—Conflict—ing Railroads.—National Metal Co.—New Works.

The long legal battle over the possession of the Lucky Tiger mine (called in Mexico El Tigre Suerte), now made famous by reason of this litigation, is thought to have been finally concluded last week by the unanimous decision of the Supreme Court of Mexico affirming the decision of the Federal district judge of Sonora in granting the *amparo* and suspension against the Enseñada Mining Co. in favor of the El Tigre Mining Co. The Lucky Tiger mine is situated in the Moctezuma district of Sonora, and a little over two years ago was obtained under option by B. F. Graham and associates, who in turn passed the option over to the El Tigre Mining Co. of Kansas City for a certain consideration to be paid Graham and his associates, Graham at the same time becoming president and general manager of the company. Work on the property showed it to be much better than was at first supposed and Graham seems to have conceived the idea of getting it for himself. He therefore resigned from the El Tigre Mining Co. and organized the Enseñada Mining Co., obtaining options from the creditors on the amounts due from the El Tigre company. Then when on July 6, 1905, the El Tigre people deposited \$48,864 in the bank of Bisbee, to be distributed in a certain proportion among the various creditors, Graham claimed the apportionment was not correct, refused to accept the money, and declared the property forfeited for non-payment. The following day, July 7, 1905, Graham proceeded to the property with an armed body of men and took forcible possession. The El Tigre company immediately proceeded against Graham both civilly and criminally, and finally obtained possession on December 13, 1905. Then followed numerous decisions and appeals, with probably some manipulations (as one judge was removed from office by reason of his decision), until now it is hoped the final decision rests in the judgment rendered by the Supreme Court in Mexico City. It seems the main dispute was whether or not the El Tigre Mining Co. had made the payments due, and the Supreme Court has decided that in depositing the amounts due in the banks to the credit of the various persons the company had complied with its part of the contract. The El Tigre company has been in possession of, and working, the mine since December 13, 1905, and has deposited close to \$300,000 in the bank at Bisbee for the stockholders of the Enseñada company, which the latter have refused to accept. It is to be hoped now that the battle is ended and the property may be developed as it deserves to be. It is possible that there is more in the fight than the mere possession of the El Tigre mine, for on February 17, 1906, the fight passed from Graham to Epes Randolph, who succeeded the former in the presidency of the Enseñada company, and many of the El Tigre company are closely associated with A. E. Stilwell in his Kansas City, Mexico & Orient Railroad, which is building across Chihuahua and Sonora to the Pacific coast. Epes Randolph is Harriman's head man in Sonora, and, it would seem, was too wise a man to take up a fight which had no better prospects than that started by the Enseñada Mining Co. And this past week there has arisen the rumor that the Harriman (Southern Pacific) interests are making every effort to beat Stilwell (the Kansas City, Mexico & Orient) to the Pacific coast.

The National Metal Co., which in April, 1905, took hold of the old sampling and testing works of Heckel-

mann & McCann and placed therein a gold and silver electrolytic refinery, has been successfully operating the plant since November, 1905, obtaining bullion as well as cyanide and sulphide precipitates from all parts of the Republic. The concessions from the Mexican Government, to which it sells all its refined gold, enables the company to give especially advantageous prices in the purchase and refining of doré bars. The end of 1906 saw the company producing 500 oz. of fine silver and 25,000 oz. of fine gold, which was about two-thirds of the capacity of the present plant. But the business has continued to grow until the company has been forced to build a new and larger plant. Twenty-five acres of land have been purchased in a most favorable part of Mexico City, near Guadalupe; the plans have been completed, the machinery ordered, and construction will be pushed as rapidly as possible. The new plant will have about three times the capacity of the present and will be a model in every particular. In addition to the electrolytic work, a small blast-furnace is to be built for treating the rich lead slags from the doré furnaces.

William Warr, associated with H. W. Blaisdell, of Los Angeles, in the Blaisdell Coscotitan Syndicate, has just returned to Los Angeles from their works at Pachuca, Mexico. The company was organized to purchase and treat tailing deposits found near old mills at Pachuca. It is estimated that they have over 2,000,000 tons, averaging \$4 per ton. A complete cyanide treatment plant has been recently built to handle 500 tons per day, and with reasonable luck it is believed it will take 15 years to exhaust the tailing on hand.

Corrigan, McKinney & Co. of Cleveland, Ohio, have purchased the San Rafael copper mine at Terrazas, in Chihuahua, from Dale Bros., of Chihuahua, Felix McDonald, of Terrazas, and W. F. Biernham, of Boston, Mass., the consideration being \$50,000. This company was formerly the owner of the Concheno gold-silver mines, which was sold to W. C. Greene and associates for \$1,250,000. It is stated that the company will install new machinery and develop the property. The work of sinking two shafts will be started at once.—The capacity of the 200-ton copper smelter at the Rio Tinto mines in the Terrazas district is to be increased to 800 tons. These mines and smelter are owned by American interests closely identified with the American Snuff Company.—The Tejana Mining Co., which is composed of Iaredo, Texas, men, has leased the Guajardo and La Constancia copper mines, situated in the Concepcion del Oro district, State of Zacatecas. The same company has acquired the Pinitos mine, in the same district.

The Los Angeles & Jalisco Mines Co., which purchased the Magistral copper mines in the Etzatlan district, Jalisco, from W. M. Mathews, is now receiving net returns of \$3,000 monthly from ore shipped to the smelter at San Luis Potosi. M. N. Graves, of Guadalajara, is manager of the company.

There is a big rush of prospectors to the rich copper discovery in Santa Cruz mountains, district of Magdalena, Sonora. The discovery was made by Edwin Arnold, mayor of Cananea, while on a hunting trip. The ore is copper sulphide. The assays run from 40 to 50% copper, with 7 to 11 oz. gold. Many claims have been taken, among them being about 8,500 acres of mineral land that were filed upon by W. C. Greene.

The Jimulco mine, in Coahuila, is producing about 80 tons of rich copper ore daily. The ore is shipped to the smelter at Aguas Calientes. The principal stockholders of the company are O. S. Newell, Otto Koehler, and Otto Wahrmund, all of San Antonio.—The Greene Gold-Silver Co. is preparing to start up its El Salto mill at Ocampo. It will also install a cyanide plant.

Toronto, Canada.

A Big Lawsuit.—Use of Lignite.—Strike at Cobalt.—Work Interrupted.—Machinery Arriving.—Ore Shipments.

An action for damages amounting to several million dollars, brought by the Dominion Iron & Steel Co. against the Dominion Coal Co., both of Sydney, Nova Scotia, for breach of contract, is now on trial before Judge Longley at Sydney. The case excites great interest in financial and industrial circles, as many leading financiers and prominent men are involved. The difficulty between the companies arose last fall over the terms of an agreement under which the Coal Co. was bound to supply the Steel Co. with coal for their plant at Sydney. A quantity of the coal supplied was rejected as unfit for steel-making purposes, whereupon the Coal Co. declared the contract at an end and refused to make further deliveries. The Steel Co. claims damages for the loss sustained in the closing down for a time of their plant and for the difference between the contract price and the rate at which they have had to purchase coal from other companies. Repeated attempts have been made to effect a compromise, but without result. The trial began July 30 and the case for the plaintiff was closed on the 8th inst. It was proved by the evidence of officials of the Steel Co. and numerous experts that the coal supplied from No. 6 colliery of the Dominion Coal Co. was unfit for steel-making requirements, being high in sulphur and ash, and full of stone and shale. Analyses made by Arthur P. Scott, the Steel Co.'s chemist, of 123 samples, showed an average of 4.44% sulphur and 12.18% ash, while the breaker coal showed as high as 9.21% sulphur and 38% ash. Important testimony was given by L. McCreith, of A. S. McCreith & Sons, analytical chemists, Harrisburg, Pa., as to the high percentage of sulphur and ash. F. W. Harbord, an English authority on iron and steel manufacture, stated that in the coke used in England there was only about 1% sulphur and 11% ash, and that a larger proportion of these constituents would be attended with risk; where coke high in sulphur was employed in the manufacture of steel rails, it would produce incipient flaws in the steel; the sulphur would cut away the fire bars and destroy the boilers. Frederick A. Foote, of the Illinois Steel Co., concurred with Mr. Harbord as to the danger of using high sulphur coke in the manufacture of rails, and also as to its detrimental effect on the plant. Some of the officials gave strong evidence as to the difficulties of working with the coal supplied and its effects in burning out the grate bars.

The Canadian Railway Commission recently issued an order prohibiting the use of lignite coal on railroads, owing to the danger from sparks, excepting during the winter months. Lignite mine-owners near Edmonton, Alberta, are endeavoring to have the order rescinded and have asked for a hearing. Experts have been sent to Edmonton on behalf of the Commission to make full enquiries.

Mining operations at Cobalt are quiet on account of the strike. Most of the men remaining at work are surface workers and little underground development work is being done. The strike organizers are working among the car-repairers at the Temiskaming & Northern Ontario Railway shops at North Bay, in the hope of inducing a sympathetic strike. There is considerable activity in the bringing in of machinery, large consignments having come forward from the Jencks-Rand Co., of Sherbrooke, Quebec. The Nipissing Co. has received two 125-hp. boilers and the Nova Scotia two of equal capacity. The Rochester mine has got in half of a 12-drill air-compressor and the McKinley-Darragh three 42-sized drills. A number of large orders that cannot be filled for some

time have been forwarded for plant. Five acres of land have been secured at Haileybury for a large foundry and machine shop, the first enterprise of the kind to be started in the district, which it is hoped will be in operation this fall. It will be a great convenience to mine-owners.

Shipments of ore from Cobalt camp for the week ending August 3 amounted to 339 tons from the following mines: Buffalo, 50 tons; La Rose, 52; Nipissing, 173; Nova Scotia, 33; O'Brien, 30 tons of ore.

Calumet, Michigan.

Activity in Building.—Many New Dwellings for Employees.—Centennial-Allouez Mill.—The Baltic Lode in Ontonagon County.—Diamond-Drilling on the Osceola Lode.

Extraordinary activity in the building line is manifested in the Lake Superior copper region this year. Gen-



Map Showing Position of Cobalt and New Districts of Ontario.

eral construction work is heavy and the mining companies are doing a large amount of building. At the Winona work is progressing on 20 new dwelling houses for the use of the company's employees. At the Allouez work was recently started on 25 new dwellings. It is expected that the Centennial will build 25 new houses for its men, the work to begin in a month or two. At the Superior mine, on Section 15, work is under way on five dwellings. The Copper Range Consolidated Co., controlling the Baltic, Champion, and Trimountain mines, also needs additional dwellings for the use of its employees, and will erect several new buildings at the Globe property, where it is developing the Baltic lode. At the Mo-

hawk, work on 11 new dwellings is nearing completion. At the Keweenaw Copper Co.'s townsite, known as Mandan, near the Medora mine, five new single houses, a boarding house, dry and change-house, a school-house, and a residence for the superintendent (A. H. Sawyer) are under construction. These will be completed in a short time. All the foundations and basements are being built of concrete. The Ojibway Mining Co., recently organized, is preparing to erect 35 houses for the use of its employees. Work on the dwellings will not be started until fall. Two buildings of considerable size are now in course of construction. One will be used as a sleeping-house and the other will contain kitchen, dining-room, etc., for the workmen. These boarding-houses will accommodate 40 men. Other structures, necessary to house the temporary equipment that will be required during the mine's development period, will be erected. The Calumet & Hecla is erecting a large brick building for a pattern-shop adjoining its new foundry at Calumet. The roof is being built of structural iron.

A crew of iron workers of the Wisconsin Bridge & Iron Co., is engaged in erecting the superstructure of the three-head addition to the Centennial-Allouez stamp-mill at Grosse-Pointe. The framework is already well advanced and as all the material is on the ground the work will go forward without delay. Two Nordberg stamps have been ordered for the addition and all the machinery for the wash department is contracted for. The other stamp will be installed later, when required. There are now three heads in commission at the Centennial-Allouez mill and with the two additional heads in service the production of the Centennial and Allouez mines can be increased more than 50%. Capt. James Chynoweth, formerly superintendent of the Centennial and Allouez mines and largely responsible for their success, inspected the workings on the new lode at the Lake Copper Co.'s property in Ontonagon county a few days ago. "Whether it is the Baltic lode or not," said Capt. Chynoweth, "is too early to say, but it certainly possesses great value. Its width is tremendous, being 60 ft. from foot-wall to hanging, carrying copper for practically the entire distance. It is a discovery that will add new life and vigor to the people and mines in Ontonagon county." Capt. Chynoweth added that the new lode is situated one mile from the Knowlton lode; intervening are several other lodes that have been opened by the Adventure, but they are of little value.

A diamond-drill has been placed in commission upon the Osceola amygdaloid at the Tecumseh mine, now a portion of the La Salle property. The drill is rigged up at a point 300 ft. north of the old shaft on the same lode and near the boundary line of the Osceola mine. The old Tecumseh company sunk a shaft upon the Osceola lode to a depth of about 2,500 ft., but the formation did not show copper in commercial quantity.

Except for a similar shaft sunk on the adjacent Syracuse property, the concrete shaft of the Pickards Mather & Co.'s Bangor mine (in Ontonagon county) is unique. Cylindrical in shape, with walls four feet thick constructed of cement, reinforced with steel rails and bands, it was put down through an overburden of quicksand and boulders that defied all ordinary methods of sinking. It is impervious to the water of the treacherous ground through which it passes and is so substantially built that apparently it will last indefinitely. Of an inside diameter of 14½ ft., the shaft is equipped with two skiproads and a ladder-way in addition to the necessary space for the piping.

Sunk by sections, the shaft has been dropped eight feet at a time as the sand has been dredged up through a cylinder of steel, and at each stage concrete has been

poured around and into the two forms attached to the steel shoe, creating thus the permanent walls. Little pumping has been required under the process adopted, the water being permitted to remain behind in the shaft, and the use of compressed air was unnecessary until the final stage of the work, when the air-lock in use at the Syracuse shaft was transferred to the Bangor, and while the shaft was entering the rock capping the orebody the water was expelled and held back by pneumatic pressure.

Butte, Montana.

**Progress of Barnes-King Mines.—The High Ore Shaft 2,800 ft. Deep.
—The East Butte Co.—B. B. Thayer on Copper Production.**

The Barnes-King Development Co. properties are being developed into big gold mines. Samuel Barker Jr. was engaged by some of the stockholders to make an examination of the mines and the progress of the work being done by the new company. His report is extremely satisfactory. Mr. Barker says that assays show an immense orebody having a value of \$20 per ton. Pay-ore has been developed for a width of 40 ft. in the Horse Shoe, and the orebody in the Mule Shoe mine will be cut at a depth of about 100 ft. by a two-compartment vertical shaft now being sunk. On the 100-ft. level south of the Barnes-King shaft, another large orebody has been developed, which will be available when the new shaft is completed to a depth of 400 ft. It will take several months to complete the shaft. A great deal of the ore mined now comes from open-cuts worked by the old company. It is the intention to get as much ore as possible from the cuts during the summer while development work is carried on underground. The capacity of the mill is about 300 tons per day, which amount is now being milled, and with the addition of a couple of new vats and a set of rolls the capacity can be brought up to 500 tons per day. The company is doing good work (concludes Mr. Barker) and should begin to pay dividends in the near future.

Sinking has been stopped on the shaft of the High Ore mine, an Anaconda property, the shaft having reached a depth of 2,875 ft. A station is being cut at the 2,800-ft. level; when completed pumps will be installed and cross-cuts run north and south from the shaft to open the veins upon which mining is being done on the 2,200-ft. level and above. The veins have also been cross-cut at the 2,400-ft. level. The High Ore is 300 ft. deeper than the next deepest shaft in the Butte district, and if the High Ore veins are found as large and rich at the 2,800 as they are on the 2,400, an immense tonnage of ore will be added to the reserves of the Anaconda Co. Sinking has now been stopped at all the Anaconda mines and work of a developing character will be confined for some time to lateral workings and connections.

The East Butte Mining Co. is cutting a station at the 900-ft. mark of shaft No. 1, and it is expected that the rich vein of ore cut at the 800 will soon be opened in the station. If the vein is satisfactory at the 900 it may be developed at that point, but whether that is done or not the shaft-sinking will continue, and will be resumed as soon as the station is finished. There has been no limit placed to the depth to which the shaft will be sunk, but it will be taken to the 1,200 or 1,500. In other parts of the mine the development work is making good progress. From the 400-ft. level of the No. 11 shaft, the south cross-cut has penetrated the Yankee Boy vein, which has a width of 60 ft. The entire vein is good concentrating ore, but eight feet of it gives an average assay of 4.5% copper, which is considered a good grade of ore for that depth. The cross-cut between the No. 1 and No. 11 shafts will soon be connected. All the mining that is done in the East Butte ground is done by lessees above the 400-ft.

level, and what ore is taken out on the 400 is extracted by the company in the course of development work. According to Manager Wall the gross earnings of the lessees during July were \$50,000, which, however, included one shipment of concentrate and the output of the precipitating plants. The company gets a royalty of 25 % on the gross.

Ben B. Thayer, assistant to the president of the Amalgamated Copper Co., has completed his semi-annual examination of Amalgamated properties in Montana and says that they are in splendid condition. "The improvements in the mines during the last 12 months have been greater than in any like period in the history of Butte, and developments generally have been most satisfactory," he said. "The possibilities of the mines of Butte cannot be estimated, for with the advance of development work the greater are the bodies of ore. The Washoe smelter is treating the largest quantity of ore in its history, but this fact does not mean that the output of the plant in pounds of copper has been increased, for it



Montana.

has been the aim of all companies to treat a lower grade of ore. In my judgment the output of copper of the Butte mines will show no increase in 1907 over the output of 1906. I think it is absolutely safe to say that the output of the United States this year will show practically no increase over that of previous years."

Salt Lake, Utah.

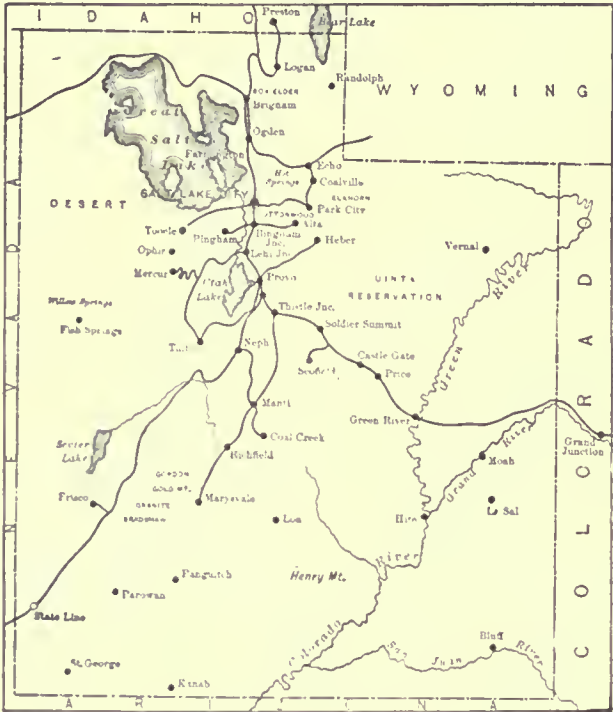
Work Curtailed by Lack of Cars.—Railroad Inadequate.—The Yampa Mine.—Shipments From Park City and Tintic.—August Dividends.—News From Park City.—Several Consolidations.

The Boston Consolidated Mining Co. discharged 300 miners who had been employed in its Bingham mines last week. According to a statement made by the management, the reason for taking such a radical step is that the company has experienced difficulty in getting cars in which to move the output of the mine to the smelters. The operating department of the Rio Grande Western railroad was notified some time ago that 25 cars per day could be used. But the railroad company has never filled the order; some days possibly 15 would be sent up to the mine to be loaded with ore; other days, 10; oftener, three or four, or none at all. The mine management has gone to the limit in trying to get service, so it was decided to cut off 300 out of the 800 men employed. The transportation problem is a most serious one at Bingham, and it begins to look as if other means of getting ore to market will have to be devised, for so far,

the Rio Grande officials have failed to appreciate the rapid growth of the camp. The company has operated one line of road into the camp for a number of years and, last year, a second line was completed; still it is unable to handle the business.

The mills of the Utah Copper Co. are not yet running up to capacity and the Boston Consolidated's plant in the immediate vicinity will not be ready for another month. Up to now the Rio Grande has had a monopoly of the Bingham business, due to a contract entered into several years ago with the Harriman system. But the situation is likely to be relieved by the operators themselves. F. Augustus Heinze, who now figures conspicuously in the Bingham Consolidated and Ohio Copper mines, has such a project in hand.

The miners of Bingham have been discussing higher wages. A committee, representing the Bingham miner's



Utah.

union, waited on the various mine managers last week and asked that the matter be given consideration. The managers informed the committee that owing to the uncertainty of the metal market, the probability of another fuel famine, and the fact that transportation facilities are inadequate to meet the demands of the operators, they could not modify wages. The fact was pointed out that Bingham ores are low-grade and unless handled upon an extensive scale mining in Bingham would be unprofitable. The refusal to consider any increase and the dropping of a large force from the Boston Consolidated mine, has had the effect of putting an end to the agitation and the probability of the occurrence of labor difficulties is now considered remote. The employees at the mines were given a voluntary advance of 10% during the early part of the year, which is to remain effective while copper sells at 15c. per lb. or better.

The Yampa mine at Bingham is one of the best in that camp and, according to advices received from an authoritative source, the net earnings for July amounted to about \$100,000. The ore treated averages 3 % copper, \$1.60 gold, and 2 oz. silver. A new reverberatory is being added to the smelter equipment and the project to build a tramway to connect the mine with the smelter will be carried out during the present year, thus improving transport.

During the past week the mines of the Park City dis-

trict shipped 1,169 tons of ore, the contributors and respective amounts being: Silver King Coalition, 621; Daly-Judge, 423; Daly, 62; Little Bell, 63 tons.—Seven Tintic mining companies have declared dividends for August. They are: Colorado, \$120,000; Gemini, \$50,000; Beck Tunnel Con., \$40,000; Uncle Sam Con., \$10,000; Grand Central, \$12,500; Lower Mammoth, \$14,250; May Day, \$8,000.

The Indian Queen and Leland mines in Beaver county have been consolidated in the name of a new company known as the Indian Queen Consolidated. The president is Jesse Knight, of Provo.—At the Salt Lake office of the Nevada Douglas Copper Co. it is stated that the new power equipment recently installed at the mine at Yerington, Nev., will be placed in commission during the present week. Shipments are to be continued as usual from the Ludwig mine recently purchased by the company.—A deal is pending looking toward the consolidation of the West Quincy and Thompson mines at

mine operated in Utah, but has been idle for many years on account of litigation. The mine has been acquired recently by the States Mining Company.

The great task of unwatering the Ontario mine at Park City by the reopening of the Ontario adit, which has been closed for more than two years on account of caves, is being pushed ahead fearlessly. In order to expedite the work and to lessen the danger to men working in the face, the management recently installed pumps at No. 3 shaft, and since starting them a few weeks ago there has been a perceptible lowering of the water in the shaft. The adit has been cleared to a point between shafts No. 2 and 3, but owing to the hazardous character of the work progress is necessarily slow. The management cannot tell how long it will take to make connection between the two shafts and completely drain the mines, although the distance between shafts is a matter of only a few hundred feet.

Denver, Colorado.

Golden Cycle Mill is Burnt.—Activity at Ouray.—Lack of Labor.—Waste of Capital.

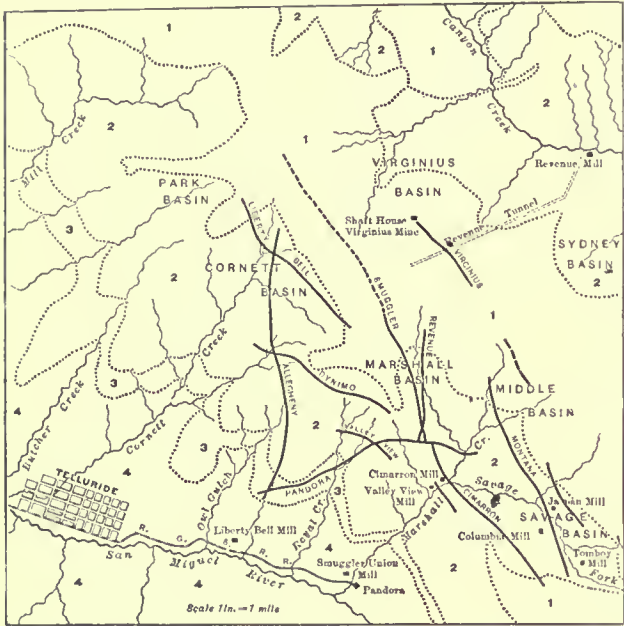
On August 7 the Golden Cycle mill, at Colorado City, was destroyed by fire. The disaster was due to an explosion in a roasting furnace. The leaching plant and refinery were saved, but all the buildings are ruined. Ten box cars loaded with ore were also wrecked. This is a disaster to the Cripple Creek district as the plant was treating 750 tons per day and was an important factor in decreasing the current charges for treatment. Originally the plant was known as the Telluride mill and it was bought by its present owners in order to be enlarged and remodeled, under the direction of Philip Argall, of Denver. The cost was \$750,000. It is expected that reconstruction will begin at once.

Later, it is learned that the fire was due to the explosion of coal dust in the fire-box of a roasting furnace. The damage is estimated at \$400,000, which is nearly covered by insurance policies. The general manager, Harvey McGarry, states that milling will be resumed in six months. Meanwhile the ore under contract will be diverted to the Union mill at Florence and the Standard mill at Colorado City.

The El Paso Consolidated G. M. Co. has been awarded the contract for the construction of the Cripple Creek drainage tunnel. This company submitted the lowest bid among a half dozen competitors, its price being \$25 per foot for the entire distance of 15,500 ft. Some of the other bids ran as high as \$42 per foot. It will be remembered that the lowest bid on the first specifications was between \$20 and \$21 per foot, submitted by Lund & Stream, of Cripple Creek, but they threw up the contract after working eight days, as they could not make the specified 300 ft. per month.

Mining developments throughout Colorado continue most encouraging. At Ouray, on the south slope of Hayden Mtn., a large body of ore of good grade has been opened up in the Mineral Farm workings, and what appears to be a continuation of the deposit has similarly been opened up in workings on another property some 1,500 ft. away. The prospects seem bright for large developments. At Rico numerous properties report favorable showings.

A problem of present importance is the lack of efficient labor. From every camp comes the demand for more men. In some places, machine-men at \$5 per day are put on as long as they can do the work at all, no matter how poorly, and the demand is equally great for other classes of labor. This labor shortage is greatly increas-



Not Classified as to Geologic Age.	1	Rhyolites and Andesites.	Eocene	3	San Miguel Conglomerate
	2	San Juan Formation.	Jurassic and Andesitic Breccia.	4	Shales and Sandstones.

Sketch Map of Telluride District, Colorado.

Park City.—A syndicate of Utah capitalists intends to construct a railroad into some coalfields in Uintah county. The line is projected to run from Provo to a point near Vernal.

The shareholders of the Northern Light Mining Co. have been called to meet at a special gathering to consider the advisability of consolidating with the Chloride Point and Columbia mines at Mercur. The new company is to be known as the Lion Hill Consolidated.—The Utah Consolidated Mining & Milling Co., the control of which recently passed to a Salt Lake syndicate, has been re-organized and will undertake vigorous development at Tintic.—Ore shipments from Tintic last week amounted to 115 carloads, the contributing mines and amounts being: Centennial-Eureka, 29; Beck Tunnel Co., 9; Colorado, 7; Yankee Con, 4; Uncle Sam Con, 3; May Day, 6; Gemini, 5; Bullion Beck, 9; Ajax, 3; Carisa, 5; Godiva, 2; miscellaneous mines, 3 carloads.

The management of the Newhouse Mines & Smelters Corporation in Beaver county has let a contract to sink the shaft at the Cactus mine below the 600-ft. level. It will be sunk to 1,000 ft.—Material and equipment has been ordered for a mill to be erected at the old Lincoln mine in Beaver county. The Lincoln was the first lead

ing the amount of leasing throughout the State, it being quite impossible in many instances to secure enough men to continue operations on company account. The lure of the Nevada fields is responsible in large degree for the scarcity of men in Colorado.

One of the stock demands of those interested in a mining district is for the investment of more capital. This should be modified to "wisely invested capital." The amount of unwisdom displayed in mining and metallurgical operations is at times appalling. For example, in a district where two smelters have already failed, a third is being built. It is to be a 'pyrite' smelter, regardless of the fact that the ores of the district are zinc-lead ores with subsidiary pyrite and chalcopyrite. In another case an enormous plant was built under the direction of an eminent metallurgist. Before it was entirely completed, his services were dispensed with, and the difficult task of starting operations was entrusted to men who, however capable in their proper sphere, were not of sufficient calibre for the task. To list the cases in which a promising lode opened up by a shallow shaft has been left to start a tunnel a half mile or so long, regardless of the probability that the lode may be barren, pinch out, or fault in depth, or become unworkable in a dozen different ways, would require a volume of the PRESS. A large part of this blundering arises from the fact that any successful business man believes himself perfectly capable of managing a mine and smelter.

Joplin, Missouri.

Zinc Prices Steady.—Lead Strong.—Output in July.—Several New Strikes.—Successful Leases.—The Value of a Name.

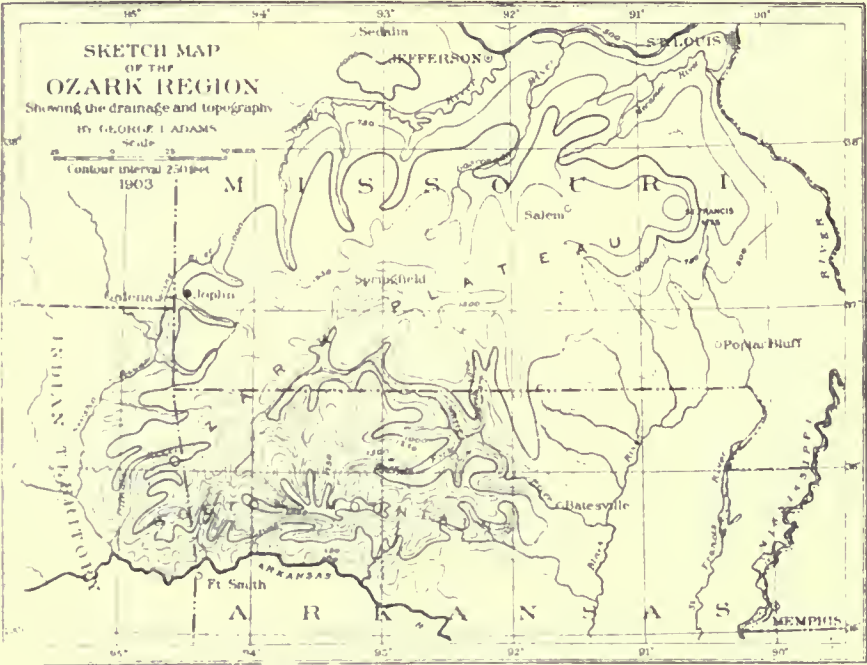
The highest price paid for zinc ore last week was \$5 per ton on an assay price of \$45 to \$48 per ton of 60% zinc. This price ruled the past two weeks, but the two previous weeks of July the basic price was \$46. The metal has been falling all the month, and the wonder is that the price of the ore has fallen so little, but it seems that it is sure to fall off a few more dollars. Lead ore is gradually climbing up, last week selling at \$64 per ton for the top price, while the previous week only showed \$62 as the top; the ruling price, however, last week was \$61 to \$62 per ton. There is a scarcity of labor in the district and at the present time there is an Idaho man here trying to induce men to go West, and no doubt many will go, only to return in a short time.

Shipments.	Zinc, lb.	Lead, lb.	Combined value.
Month of July	47,068,870	5,298,080	\$ 1,220,501
7 months this year	363,073,360	54,852,300	10,903,316
7 " last	312,317,740	44,543,230	8,417,688
Increase	50,698,620	10,309,070	2,485,628

The Pittsfield Mining Co. is the owner of a rich property in the Prosperity district, consisting of 10 acres of the Chinn land. In sinking the shaft ore was encountered at a depth of 140 ft. and continued for a distance of 10 ft. At present six men are working with two hand-jigs, and a good dividend is being cleared weekly. The company is at present sinking another shaft in order to facilitate the handling of ore, which will be run over a mill to be erected in the near future.—The activity about Carl Junction is attracting the attention of mining

men. A recent strike near the old Lehigh mine, a good one in the early days, is being developed by utilizing steam-shovels, the ore having been discovered almost at the surface of the ground. So far a considerable territory has been stripped and rich milling ore has been mined.

One of the busiest spots in the district is to be found about three miles west of Joplin, in the neighborhood of the Paragon, Iroquois Hero, and Osceola mines. Two years ago this part showed but little development. Since then all these mines have been developed and an upper run of ore worked, but now the lower or sheet-run is being sought for, and with a marked degree of success. George P. Andrews obtained a lease on 30 acres of land having two shafts on it; he sunk one of them to a depth of 170 ft., where he encountered the sheet-run of ore; a mill was erected and much ore has been produced. The Hero has also a distinct run of sheet ore, as three shafts have proved.—The Columbia Zinc Co., owning a 10-acre lease on the Luke land west of Joplin, has a shaft



down to 130 ft. The land has been thoroughly drilled, six holes showing a sheet formation.—J. V. Boucher has made one of the richest strikes of recent years in the old Chitwood district. He has a lease on 52 acres on the Glover land, and a drill-hole just completed shows a good vein of ore from the 160 to the 185-ft. level. The company will let a contract for two 300-ton concentrating plants at once.

Thirty years ago James Luke, who owns the Luke land west of Joplin, on which some good mines are now coming into prominence, met a man by the name of Luke and tried to trace a relationship, but failed. A couple of years ago he met Howard Luke, and they, too, tried to trace relationship, and James Luke found his his new acquaintance to be the son of the Luke he met years ago. He became interested in the young man and gave him a first lease on 10 acres of land. The young man leased his land to a company of Pennsylvania capitalists, and they began prospecting it with the result that there is now just about completed a big 300-ton mill, of which Mr. Luke is superintendent, and which it is thought will be in operation by the middle of this month. The royalties from this 10-acre tract will make him a fortune.—All the mines in the Badger-Peacock district that were completely inundated on May 13 will be in full operation again by next week. This will add 300 to 350 tons of ore to the weekly output.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

A ROUGH estimate of the amount of water required to sluice sand out of leaching vats, is 100 gal. water per ton of tailing.

BESSEMER STEEL is steel made by the bessemer process, irrespective of whether its carbon content is high, low, or intermediate.

PUMPS ordinarily should not have a piston travel of over 100 ft. per min., and for continuous boiler feeding service a little less than half that speed is recommended.

GRAY PIG IRON and gray cast iron is pig iron and cast iron in the fracture of which the iron itself is nearly or quite concealed by graphite, so that the fracture has the gray color of graphite.

IF the height of a tank is known, to find the diameter required for any given capacity, divide the cubic capacity desired by 0.0034, divide the remainder by the height in inches and extract the square root. The quotient thus obtained is the diameter in inches.

IF A PUMP is giving trouble, it is usually advisable to leave the steam end alone, and look to the water end or the suction pipe for the cause. The steam valves probably do not need changing, but the water valves may need resetting, and the water piston repacking.

IT is generally best to place a pump as near the water supply as possible, as the atmospheric pressure alone forces the water into the pump, and consequently the lower or shorter the lift, the faster, and with greater efficiency will the water be delivered to the pump.

CONDENSING ENGINES require from 20 to 30 gal. water, at an average low temperature, to condense the steam represented by every gallon of water evaporated in the boilers supplying steam to the engines, that is, about 1 to 1½ gal. condensing water per minute per indicated horsepower.

IF A PLACER CLAIM was located in April, 1906, and no assessment work has been done upon it, the locator has still the whole of the calendar year 1907 in which to perform the assessment work. If on January 1, 1908, the work has not been performed—and the locator is not, at the usual working hours of that day, in possession—the claim is subject to re-location.

FOR the treatment of silver ores by hypo-sulphite solution, it has been the general practice where gold is contained in the ore in some quantity, and especially in an arsenopyrite ore, and where salt is cheap, to use as high as 12% of salt. In this way the extraction will be high in gold as well as in silver and the resulting sulphides will be cleaner and of higher grade. As a general rule it is desirable to crush dry, and not finer than 30 mesh.

THE Standard group of mines at Bodie, California, has produced in 25 years, \$14,500,000, paying \$5,000,000 in dividends. On the other hand, this output has been mined (almost wholly above the 1,000-ft. level) from a system of more than 100 veins, ranging in thickness from 0.5 in. of specimen rock to 30 ft. of clay and quartz; distributed through a zone about 2,000 ft. in width, and representing from three to five distinct periods of formation.

MERCURY, arsenic, antimony, and tin form each two stable classes of salts. Therefore, the lower oxides, chlorides, etc., of these metals act as reducing agents, and their higher oxides, chlorides, etc., as oxidizing agents, each to the extent of its chemical force. Arsenic, antimony, tin, molybdenum, and several of the rare metals of these groups enter into acidulous radicles, which form stable salts. Arsenic, selenium, and tellurium are metalloids rather than metals, while arsenic, antimony, and bismuth belong to the nitrogen series of elements.

NICKEL does not cast well in the pure state, as it absorbs carbon monoxide and then gives it out on cooling, thus causing blow-holes. This difficulty is overcome by the addition of a small quantity of magnesium—about one-eighth per cent. Aluminum and phosphorous have been suggested for the same purpose. Copper and nickel alloy readily in all proportions. When added to copper it affects the color but slightly. Until the alloy contains about 30% of nickel, the coppery color is still distinguished, but when the proportion of nickel approaches 40%, the alloy becomes silver white, and continues unchanged in color until the nickel reaches about 80%, after which the color darkens considerably. Copper-nickel alloys are rarely used, except for coinage. German silver includes a large number of alloys containing copper, nickel, and zinc in different proportions, sometimes with the addition of other metals.

THE provisions of the Nevada statutes on the subject of work necessary to be done to perfect a lode mining location are as follows: "The locator of the lode mining claim must sink a discovery shaft upon the claim located, four feet by six feet, to the depth of at least ten feet from the lowest part of the rim of such shaft at the surface or deeper, if necessary to show by such work a lode deposit of mineral in place; a cut, or cross-cut, or tunnel, which cuts the lode at a depth of ten feet, or an open cut along the said ledge or lode, equivalent in size to a shaft four feet by six feet by ten feet deep, is equivalent to a discovery shaft."

This work is to be done within ninety days of the date of posting the location notice. There is no statutory rule requiring the discovery to be in the centre of the claim, but the U. S. Surveyor General for Nevada, requires it as a condition precedent to the approval of survey for patent.

THE Lake Superior region, which includes five mineral ranges in States bordering upon the great inland sea, continues, by augmented annual outputs, to outrank all other known deposits in supplying iron ores. In the year 1905 its production was 33,325,018 long tons. The mines which compose the five ranges of the Lake Superior region contribute more than three-fourths of the total iron ore mined in the United States, and up to a year ago this region has supplied an aggregate of over 300,000,000 long tons of iron ore. Of this quantity the Marquette range in Michigan, which has been producing since 1851, had shipped 77,000,000 long tons; the Menominee range, in Michigan and Wisconsin, had, since its opening in 1877, furnished 53,500,000 long tons; the Gogebie range, in Michigan and Wisconsin, opened in 1884, had shipped 47,000,000 long tons; the Vermilion range, in Minnesota, opened also in 1884, had supplied 23,500,000 long tons; but the phenomenal shipments have been from the Mesabi range in Minnesota, which since 1892 have reached a total of 99,000,000 long tons, or nearly one-third of the ore obtained from the Lake Superior region.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

Slag Dam.

The Editor:

Sir—I am in receipt of your letter of July 16, making inquiry as to a certain dam near Helena, made of smelter slag. This undoubtedly refers to a slag dam which was built at the East Helena plant of the American Smelting & Refining Co. about eight or nine years ago.

Nothing was used in the construction of this dam but slag from the lead blast-furnaces. The object was to back up the waters of Prickly Pear creek so as to form an artificial lake for storage purposes. A trench cut about 4 ft. wide and 4 or 5 ft. deep was first dug across the site of the proposed dam, the object being to form a heart-wall down to water level so as to minimize the danger of the water leaking through at the bottom of the dam. Molten slag from the furnaces was simply poured into this trench and then over the entire surface of the ground at the proposed site of the dam, making a solid wall 200 or 300 ft. wide and 20 to 30 ft. deep. This dam has, of course, gradually been widened as the necessity for providing additional space to dump our slag increased. At the further end of the dam arrangements were made for taking care of the surplus water by building a spillway of concrete with the usual gates for controlling the water.

We have found that this slag makes a good dam and we have had very little trouble with it since it was constructed. Owing to the brittle nature of blast furnace slag and its tendency to crack, there is, no doubt, more or less seepage through this dam, but it is not enough to cause any serious trouble.

F. M. SMITH.

East Helena, Montana, July 30.

Tube-Mills at Guanajuato.

The Editor:

Sir—As to our experience with our tubes: Apparently it has been markedly different from that of a good many people, and we really do not understand the reason why, as we have had no difficulty whatsoever, aside from routine replacements in the eight or nine months we have been running them. These mills, as you know, are the Abbé mills, 4 ft. 6 in. by 20 ft., and are handling about 80 tons of pulp per day.

A screen test made on pulp going to the tube-mill shows:

	Mesh.	Per Cent.
Remaining on	40	11.2
"	50	11.2
"	60	8.9
"	80	16.6
"	100	16.3
"	120	26.1
Passing	120	9.7

Moi-sture 60%.

The screen test on discharge-pulp shows:

	Mesh.	Per Cent.
Remaining on	10	0.5
"	50	1.7
"	60	2.9
"	80	6.0
"	100	16.2
"	120	21.8
Passing	120	51.2

Mechanically the mills have given us no trouble since their installation, with the exception that the first pinion shipped with the mills was shrouded and the distance between the shrouds was not sufficient to allow for any end motion whatsoever of the mill as a whole, and the gear ultimately rode the shroud of the pinion, smashing

both the gear and the pinion, but doing no further damage; since replacing with a pinion wider between the shrouds, no difficulty whatever has been had.

To limit the end motion upon this type of mill, two guide-rollers with vertical axis bear upon the sides of the supporting tire next the gear end, and a good deal of trouble has been had by earlier users of the mill, we understand, on account of the tendency of the mill to run endwise, being so severe that these guide-rollers were quickly worn out; the Abbé Company suggested to us, before our first mill was installed, that it was possible to cant the friction-rollers upon which the tire moves (and which constitute the support of the mill) in such a way as to cause the main tube to go in either direction longitudinally, and that by delicate adjustment of this canting, it should be possible to confine the mill entirely to one position without its bearing unduly hard on either of the guide rollers. We experimented with this and within the first day or two after the mill was started we found it possible by this adjustment to cause the main tube to 'float' entirely free on its supporting rollers without touching either of the guide-rollers at all, and the mill ran for three months at one time without touching either guide-roller, and normally it hardly touches them once a day.

The silix lining of the mills has given good satisfaction, the first lining running eight months before it had to be replaced, though at the end of about six months, three or four defective blocks were replaced, with a two days' shut-down.

A great deal depends apparently upon the truth of the supporting tires and the homogeneity of the material composing it, because if in these tires the slightest irregularity occurs, either as an original defect or as the result of operation, bumping would rapidly ensue, which would cause the destruction of the mill and perhaps its foundations. So true is this that we found on starting the first mill, that a film of $\frac{1}{16}$ of an inch of sand, which had accumulated on certain oily spots on the tire, caused violent bumping, until the mill was stopped and the ring tire carefully cleaned off. We keep these tires at all times carefully cleaned and a little oil is put on the surface of the tire once or twice a day. Since the tires were first cleaned, there has not been the faintest bump or vibration evident about either mill, the mills running as quietly and smoothly as possible. The mills are kept filled slightly above centre with pebbles, the pebble wear being approximately $\frac{1}{4}$ lb. per ton of ore treated; silix linings wear eight months; power to start the mill, about 60 hp., which immediately drops to 43 hp. as soon as at running speed.

Trusting that the above data may be of interest to some of your readers.

C. W. VAN LAW.

Guanajuato, Mexico, July 14.

Absurdities of Promotion.

The Editor:

Sir—The absurd statements of mine promoters' literature receive occasional notice in your columns, but these writers of lurid fiction must draw more freely upon their imagination or else yield the palm to one E. G. Lewis, editor of the St. Louis *Woman's National Daily*. In the July 20th issue of that publication this veracious writer, in a signed editorial under the caption 'Gold as Money,' makes the following statement:

"A single reef in the strand in Africa is known to contain enough gold to give every person in the world \$30,000, the only question being how fast it shall be produced, a question of machinery and labor."

As the population of the world is usually estimated at

1,400,000,000, this reef in the African "strand" (whatever that may be) is "known to contain" \$42,000,000,-000,000! Shades of Letson Balliet, Dr. J. Grant Lyman, and all others of that fraternity, arise and salute your chief! With one sweep of his facile pen this guileless and untutored Missouri editor establishes a high-water mark for 'ore in sight' that must make the most imaginative promoter gasp with admiration and turn green with envy.

What a waste of good raw material it seems when we contemplate an individual who can thus dip his pen in the colors of the rainbow writing platitudinous homilies for a woman's paper! Really, it's too bad. Caesar a nursemaid or Napoleon a gooseherd could hardly present an illustration of a greater misfit. Mr. Lewis should abandon petticoat journalism and give his talents fair scope by opening an Eastern office for the promotion and sale of Western mining stock.

AUBREY L. WISKER.

Winnemucca, Nevada, July 22.

A Fundamental Problem.

The Editor:

Sir—A question involved in your editorial of June 29 has probably presented itself in various forms to many people, and a general discussion should be interesting. Undoubtedly, there is rather a wide-spread idea among men who have dipped into the mining business without knowing much about it, that it is "not possible to employ experts that will give concrete advice as to what to do and when to do it," and that "mining is only a gamble after all." As to this particular case, the key to the correct solution is probably given in your first paragraph, when you say: "Finally, two mining engineers of experience were engaged," who reported unfavorably on the properties. Had they been engaged 'firstly' instead of 'finally,' these brokers and their clients would probably have been saved some money and a good deal of mental wear and tear.

One mistaken idea that many men seem to have, is, that good properties are to be had for the asking. That it is only necessary to get a little money together, send a man out into the field, and have him come back shortly, loaded with choice embryonic mines. They expect him to do this with as much ease and celerity as they expect the bell-boy in their hotel to bring up a high-ball, in response to the touch of a button. As a matter of fact, men who follow the mining business are always on the lookout for good properties. Every engineer has visions of some day getting hold of 'something for himself.' Thus the mining districts, and every conceivable spot, to the ends of the world, are constantly being scoured by an army of keen-eyed, clear-brained, carefully-trained men, each looking for something good, and looking for himself, which guarantees that his heart is in his work. In addition to these men there are the representatives of hundreds of big syndicates and exploration companies, whose business it is to go over the surface of the earth with a fine-toothed comb, from the poles to the equator and back again, always hunting for desirable properties, promising prospects, or good indications. The zeal of these men is only second to that of the individuals operating independently, and they have practically unlimited capital behind them. And yet every day we see men who have made a competence in their calling and feel that they have a little loose money with which to do as they please, deciding to form a pool or a syndicate and get hold of some good mining properties. Then if they go into a boom camp and tinker around in three or four different spots out on the wash, or run a 100-ft. tunnel into a volcanic plug somewhere, spend a

few thousand dollars, and fail to develop a Robinson or a Homestake, we hear a great howl against the profession of mining engineering; they forget that it costs money to make a mine, even after you get a good prospect, that many a good prospect has been spoiled by sinking on it, and that even fair prospects are rare.

It may be that these brokers made the serious mistake of suddenly deciding that they wanted to own a mining property, and wanted it quick. This is probably where a great many promoters, with the best of intentions, fall down at the start, because a cheap man, sent out with instructions to get a property, and to get it quickly and cheaply, has not much latitude in which to work, and must choose the least undesirable of the claims that he sees. If he exercised his judgment to the extent of returning with a report that there was no good ground available, and that he would not recommend the purchase of any claim, the impression would be either that he had not done his work thoroughly, or that he was mistaken, and another man would be sent out with positive orders to find something. Of course, it is out of the question for a small concern to secure the services of an expensive man to do the preliminary searching for a property. Therefore, they get either an inexperienced man, possibly in the shape of a young college graduate, who is still brimming over with youthful enthusiasm and untarnished optimism, or some 'practical' man who can polish a spot the size of a ten-cent piece on the end of a drill, but who is entirely incompetent to pass judgment on a proposition of this kind.

If a man with experience and training is consulted, it is generally after most of the available funds have been spent, and the brokers want to know whether to 'throw up the sponge' or 'reorganize,' both of which procedures are about equally lucrative to the investors.

In deciding upon a man to examine a property lying in a new camp or one undergoing a boom, it is almost always advisable to send an outsider, even though it costs a little more. The reason for this is that the men on the ground are too often imbued with the boom spirit, and are unduly sanguine. Also the fever of stock speculation often warps otherwise sound judgment, and it will be found that many of these men have private interests to further. Anyway, as our standards are all relative, at best, the tendency will be for them to judge your property by comparison with others in the camp, all of which may be of questionable worth, and to pass upon the valuation on the basis of what other properties near it are bringing, irrespective of its real value. Another curious trait that engineers often discover in clients of this kind, is an aversion to receiving an unfavorable report. After they have spent a few thousand dollars on a property, they are inclined to consider it as a personal affront when the engineer tells them it is worthless. They do not like to be waked from their pleasant dreams of easy money and big profits. Many men seem to reason that if they stop work and abandon the property, the money they have put in will be a dead loss, while if they keep on gophering around they may strike something or something may turn up—perhaps a purchaser or a new boom. In other words, after the men own the property and some money has been spent, it will take three men to convince them that it is better to stop, where one man can persuade them to continue. The best advice as to what engineer to employ for the final decision can be had from some one in the profession. If these brokers knew no mining man upon whom they could rely for an examination or for such advice, they must have been strangers to the mining business and could hardly expect to win.

S. T.,

San Francisco, July 22.

The Relation of Ore-Deposition to Physical Conditions.

BY WALDEMAR LINDGREN.

*It is well known that chemical reactions under ordinary surface conditions differ widely from those which prevail at great depths. Heat increases gradually below the surface until temperatures of potential rock fusion are attained, and pressure undergoes a corresponding increase. The normal increment of temperature and pressure with depth can rarely, however, be separately considered, for intrusions of molten masses of rock may locally carry temperatures of abyssal depths closer to the surface, and at the same time increase the pressure far above what is normal for any given depth. Whenever, therefore, reference is made to deposits formed at great depth this reservation must be borne in mind.

In speaking of ore deposits of varying depths the discussion always refers to the vertical distance from the points or levels under consideration to the surface of earth at the time of genesis, which involves, of course, the possibility of at least an approximate estimate of the amount of erosion that the deposit has suffered since its initial formation, and of the geological epoch during which this formation took place.

It is significant that ores deposited in ancient eras often differ markedly from those of more recent times—and especially is this true of the ores of pre-Cambrian times; but these differences are largely accounted for by a deep erosion which has laid bare deposits formed at great depth. Moreover, since their genesis, the latter have been subject to many changes by rock-pressure and by the action of solutions.

Evidence of the genesis of metallic ores by hot waters has accumulated rapidly in the last few years. It is believed by many geologists that these hot waters were of magmatic origin. Possibly the zeal of the advocates of this view may carry them too far, and it is by no means denied that important ore deposits may be formed by sedimentary processes or by cold or hot circulating waters of atmospheric origin. No special attempt will be made in this place to advocate the deposition of ores by magmatic waters, although the probability of such an origin will be indicated as a corollary from the classification herein outlined. Little emphasis will be laid upon the form of the deposits, as that is chiefly due to the various physical and chemical conditions of the rocks through which the hot solutions found their way.

To the mode of deposition in open cavities a few words may be devoted. It is universally conceded that open spaces of desiccation and solution may easily exist down to a depth of many thousands of feet below the surface. The hydrostatic pressure due to gravity will to some extent counteract the rock pressure and help to keep fissures open.

But it is undeniable that in many abyssal ore deposits formed at very great depths below the surface veins are found which are undoubtedly due to the filling of rather large open cavities, which it is very difficult to conceive as having remained open under the tremendous pressure prevailing. An explanation has been sought in the force of crystallization; it has been supposed that this force would be great enough to force the walls apart. Still, it seems scarcely possible to attribute such power to it as would be necessary to force deep-seated crevices apart to form room for the crystals, and another strong objection is that it would seem impossible that under

these conditions comb structure and coarsely even-grained quartz could be produced.

L. C. Graton, in his recent studies of the gold and tin deposits of the southern Appalachians, has another explanation which is more likely to be the correct one. According to him, the solutions which are of magmatic origin are under exceedingly heavy pressure in the deeper part of the crust, gradually diminishing as they ascend toward the surface, and this pressure, intimately related as it is to the tension of the intrusive magma from which the water is given off, would be abundantly sufficient to open the crevices to cavities and to allow undisturbed crystallization of the mineral substances dissolved in it. The magmatic solution would be essentially similar to magma intruding into dikes or to pegmatites crystallizing into hot granitic rocks; the pegmatites sometimes show most excellent comb structure, and their closed structural relationship to certain classes of ore-bearing veins is one of the points substantiating the hypothesis explained above.

Few conceptions have caused greater advance in the study of the crystalline schists than that of gradually changing zones, each characterized by certain minerals stable under the conditions obtaining. The same principle is applicable to the ore deposits. The watery solutions ascending through the earth's crust are subject to constantly changing pressure, temperature, and mass conditions; certain minerals stable, for instance, under very high pressure and temperature, can no longer exist under conditions prevailing near the surface. By careful consideration of geological conditions it becomes possible, in most cases, to decide whether a given deposit has been formed at the surface, at moderate depths, or at a very great distance below the surface. Certain minerals have then their 'critical level' which they cannot leave without falling prey to decomposition, while certain other minerals have such a large interval of existence that they may be classed as 'persistent' minerals.

Upon comparing the mineral records of ore deposits found at various levels of the earth's crusts, with the results obtained by students of general metamorphism, it very soon becomes apparent that the same laws do not apply to both cases, although there are many points of similarity. The reason for this is not difficult to find. In metamorphism one deals with small quantities of solutions, as a rule, free from large amounts of carbon dioxide and sulphide of hydrogen. The ore deposits, on the other hand, were formed by large quantities of waters rich in these gases, heavily charged with alkaline carbonates, and ordinarily of a high temperature. A large number of silicates, and other minerals, fairly stable under the influence of ordinary deep ground-water, are incapable of existence in most vein-forming solutions. Biotite, amphibole, soda-line feldspars, often also chlorite and serpentine, as well as magnetite, are included among these. Under high pressure and temperature many of these minerals prove stable, however, and are even formed by metasomatic processes in the veins. In the contact metamorphic ore deposits, formed under very high pressure and temperature, a new set of minerals will develop, some of which are especially characteristic for these occurrences.

Phenomena of stress are in most cases excluded during the formation of ore deposits; static conditions and hydrostatic pressure prevail.

The mineral deposits described below occur almost without exception in or close to masses of igneous rocks. For the pegmatites and contact metamorphic deposits this is self-evident, both classes being associated with bodies of rocks intrusive into the crust at varying but generally great depths below the surface. For several

*Abstract from paper read before the Mexican meeting of the International Geological Congress, September 10, 1905. Published in *Economic Geology*, Vol. 11, No. 2.

classes of veins a similar relationship to intrusive rock masses has been proved. In typical examples the intrusive body—which may be a granular rock or a porphyry—is surrounded by an aureole of contact metamorphic deposits of lead and copper, but usually poor in the precious metals. Fissure veins bearing gold and silver are either contained in the igneous rock itself or in its immediate surroundings.

The veins in the pre-Cambrian rocks have in many places in the United States been demonstrated to have a pre-Cambrian age. Many geological conditions indicate that these deposits have been formed at great depths below the surface, and here, too, as a rule, a relationship to intrusive rocks can be shown.

There is still another and large class of veins carrying gold and silver which cut through volcanic flows of Tertiary or later age. In these we are enabled to fix the level of deposition with greater accuracy, and often it can be demonstrated by geological or physiographical considerations that a given deposit was formed only a few hundred feet below the original surface of the lava flow. Lastly, the orifices and sinters of the hot springs so abundant in these volcanic regions may be examined and the minerals here formed may be compared to those of veins and other deposits known to be formed at much greater depths.

The ore deposits discussed in this paper may be divided into three main classes:

1. Ore Deposits Consolidated From a Molten Magma.

Characteristic Minerals.—Magnetite, ilmenite, chromite, pyrrhotite, chalcopyrite, pyrite (?), pentlandite; they contain copper, nickel, and cobalt, but are very poor in gold and silver. Platinum is sometimes present. Accompanying gangue minerals are those of basic or acid igneous rocks.

2. Ore Deposits Made by Aqueo-Igneous Solutions.—Pegmatite-Dikes.

Characteristic Minerals.—Magnetite, bornite, arsenopyrite, molybdenite, cassiterite, wolframite.

Accompanying Gangue Minerals.—Quartz, muscovite, alkali feldspars, tourmaline, apatite, fluorite, spodumene, more rarely hornblende, soda-lime feldspars, et cetera.

These deposits contain very little gold and silver and are very rarely economically important except for tin ore, and minerals of the rare metals. Metasomatic action of the solution on walls of crystalline rocks is usually slight, though tourmaline and cassiterite may develop in the surrounding, usually granitic, rock. Pegmatite formation evidently requires a high temperature and the conditions are decidedly deep-seated. The solution has a tendency to take up substance from the wall-rock which may become part of the pegmatite and crystallize as garnet, zoisite, andalusite, staurolite, and feldspars. Pegmatite veins may gradually change into quartz veins, but no transitions have been satisfactorily shown to exist between these and the gold-bearing fissure-veins. At many contacts of intrusive rocks not characterized by pegmatites, quartz veinlets abound and often carry crystallized specularite.

3. Ore Deposits Made by Aqueous Solutions.

A. OF DEEP-SEATED ORIGIN.

(a) ORE DEPOSITS DUE TO CONTACT METAMORPHISM OF SEDIMENTS BY INTRUSIVE IGNEOUS ROCKS.

Characteristic Ore Minerals.—Magnetite, specularite, pyrite, pyrrhotite, bornite, chalcopyrite, zinc blende, galena, molybdenite. (Complicated sulpho-salts, antimonides, tellurides, etc., are absent.)

Gangue Minerals.—Andradite and grossularite-garnet,

epidote, pyroxene, wollastonite, ilvaite, actinolite, spinel, diopside, calcite, quartz, scapolite, apatite, and tourmaline. Biotite and muscovite, though occurring in contact metamorphic argillaceous rocks, are not common in the ore deposits. These deposits, which are almost exclusively of metasomatic origin, are apparently caused by replacement of calcareous rocks by very hot solutions given off by the cooling magma. These solutions were probably above the critical temperature and thus really in gaseous condition.

The deposition is, as a rule, confined to rocks on which the solutions exerted a strong chemical action.

The majority of contact metamorphic deposits are poor in gold and silver.

(b) CASSITERITE VEINS.

Characteristic Minerals.—Cassiterite, pyrite, arsenopyrite, specularite, quartz, tourmaline, topaz, lepidolite, muscovite, apatite, fluorite, and wolframite; calcite and siderite are not abundant.

The metasomatic processes along the veins are intense and result in the conversion of granites, crystalline schists and slates into often coarsely crystallized quartz, tourmaline or quartz-topaz-muscovite rocks.

The metasomatic action on limestone and clay slates is not known.

Feldspars and dark silicates are not stable but are replaced by the minerals mentioned; quartz is re-crystallized. The changes in chemical composition are not extensive, as far as known, and no great concentration of potassium, so frequent in other classes of veins, is observed. Fluorine, boron, and many of the rarer elements are introduced.

The occurrence is as veins in and around intrusive masses of normal granite rich in soda.

(c) APATITE VEINS.

Characteristic Minerals.—Apatite and other phosphates, scapolite, diopside, hornblende, biotite, specularite, and pyrrhotite. Strong metasomatic action of the country rock is the rule and results in the development of scapolite, replacing soda-lime feldspar, and of malacolite replacing limestone. The introduction of chlorine or fluorine is characteristic, but the metasomatic processes are not known in their chemical details.

The occurrence is as veins following fissures or contraction joints in or about basic intrusives. High pressure and temperature are probably necessary for the genesis of these veins, which are poor in gold and silver.

(d) GOLD AND SILVER-BEARING VEINS.

The deep-seated veins containing gold and silver, with which are usually associated other metals in varying amounts, form a most important class, to which the larger proportion of the world's production of gold, and much of its silver, is due. They constitute a series with gradually changing characteristics, impossible to separate in sharply defined subdivisions.

The first group to be discussed is found in pre-Cambrian formations in various parts of the world. All geological indications point to their formation at great depths under heavy pressure and at high temperature. They are not entirely confined to these oldest formations, but also appear at places in more recent rocks wherever igneous intrusions have created the necessary special conditions of temperature and pressure.

Characteristic minerals are gold, pyrite, pyrrhotite, galena, zinc blende, magnetite, specularite, ilmenite, quartz, biotite, tourmaline, garnet (pyrope), hornblende, chlorite, apatite, spinel, and epidote. Calcite is also present in small amounts. The replacement of the country rock is usually strongly marked; amphibolites and

micaceous schist are replaced by tourmaline, garnet, a green biotite, and epidote. The presence of apatite, magnetite, and ilmenite is noteworthy. Soda-lime feldspars are unstable under the influence of the vein-forming solutions, and alkali-feldspars do not form as a rule. There are no data as to the changes effected in limestone or argillaceous rocks, as the veins have not been observed in such surroundings.

The veins occur in, or close to, granite intrusive in schist.

In certain veins of this group sericite forms together with biotite and transitions obtain to the most common type of gold and silver veins, namely, the sericitic and calcitic type, which is so abundantly represented throughout the Cordilleran region in the vicinity of deep-seated intrusions in rocks ranging in age from pre-Cambrian to Cretaceous. Though usually appearing as fissure veins, the deposits very often assume an irregular or bedded form wherever the containing rocks are easily soluble. Pressure and temperature must have been moderately high and the depth below the surface several thousand feet, as a minimum. All of these veins have been exposed by deep erosion and their epoch of formation can, in most cases, be shown to have closely followed the particular intrusion with which they are associated.

The principal minerals are: Gold, pyrite, chalcopyrite, arsenopyrite, galena, zinc-blende, molybdenite, tellurides, tetrahedrite, often the mercurial variety; more rarely pyrrhotite and cinnabar. As gangue minerals appear quartz, calcite, dolomite and siderite, sericite, sometimes chlorite, barite, and fluorite. The carbonates increase in quantity compared to the previously described class of veins. Absent or very rare are magnetite, specularite, hornblende, garnet, epidote, tourmaline.

A fairly thorough examination of the metasomatic conditions of this class of veins has been made. In ordinary igneous rocks almost all of the rock-forming minerals are unstable under the influence of vein-forming solutions of this kind. The list of unstable minerals comprises, among others, orthoclase, microcline, soda-lime feldspars, nepheline, amphiboles, pyroxenes, epidote, magnetite, ilmenite, and titanite. Chlorite is, as a rule, ultimately decomposed, although somewhat away from the veins the first step of alteration by the solutions, here robbed of most of their active constituents, consists in a chloritization. In a few veins chlorite is capable of recrystallization with quartz. Quartz is on the whole stable but under the influence of solutions heavily charged with carbon dioxide a replacement and re-deposition of quartz by calcite, dolomite, or siderite occurs. The two processes of carbonatization and sericitization prevail, and almost all of the original minerals are subject to them. Either one may quantitatively prevail according to the local composition of the solution. Carbonatization turns all or a large part of the iron, manganese, magnesia, and lime of the rock into carbonates. Complete sericitization transforms the rock into a mixture of feldspar and quartz and is usually accompanied by a removal of the iron and earthy bases, due to lack of carbon dioxide to fix them.

Titanite is altered to rutile and calcite; magnetite often to siderite; ilmenite to rutile and siderite. The only feldspar which approaches stability is albite. In rocks very rich in albitic, like the amphibolites of California and Western Australia, only a smaller amount of sericite forms; the albite is dissolved and re-deposited with quartz and carbonates either as filling or as product of replacement. Apatite appears stable but is not formed as an original vein mineral as is the case in the more deep-seated deposits. Pyrite replaces, in varying quantities, almost all of the rock-forming minerals, but espe-

cially those rich in iron. Gold and most of the heavy metals penetrate the country rock only with difficulty and are deposited in the open spaces, if such are available. Silicification of the wall-rock is a rather local and exceptional mode of alteration, as ordinarily the wall-rock acts as a semi-permeable membrane which does not admit the colloidal solution of silica, while gases and salt solutions may easily permeate it. When silicification takes place it is usually due to mass action of surrounding shattered or porous siliceous rocks.

Clay slates consisting of quartz and sericite are very little affected by the vein-forming solutions, but in shattered rocks of this kind a silicification often takes place. The same is often true of sandstones. In both, pyrite is apt to form in abundance. Clay shales consisting of quartz, feldspar debris, glauconite, and kaolin are a little more affected and often suffer carbonatization, sericitization, and pyritization.

The effect on calcareous rocks is of particular interest, and very different from the processes just described. In some veins which are closely related to intrusive bodies, such as the pyritic veins of Clifton, Arizona, it has been found that the impure limestone adjacent to the veins alters to tremolite or diopside, with which are associated pyrite, magnetite, and some epidote. The same vein solutions sericitize the monzonite porphyry of the district.

But in by far the majority of cases the pressure and temperature do not appear to reach the requisite point for the metasomatic development of these minerals. Ordinarily the limestones are simply silicified to fine grained jaspery rocks, or transformed into dolomite. Calcareous rocks are easily penetrated by solutions of heavy metals, and hence the metasomatic development of pyrite, zinc-blende, galena and chalcopyrite in them is extensive and important.

B. ORE DEPOSITS FORMED AT SHALLOW DEPTHS.

In the Cordilleran regions, as well as elsewhere in the world, veins containing gold with much silver, and, more subordinately, lead, zinc, and copper, are found in flows of volcanic origin. In very many cases the geological conditions enable us to say with considerable certainty that these deposits have been formed at a relatively slight depth below the surface, say from a few hundred to four or five thousand feet below the actual surface of the ground, at the time of mineral deposition. Among these are, for instance, most of the veins of western Nevada, the San Juan region of Colorado, Cripple Creek, and a great many ore deposits of Mexico.

These deposits are closely related to the sericitic and calcitic veins formed at greater depths which were described in the preceding paragraph. An unbroken line of transition between them may in fact be found, but at the same time veins formed at slight depth possess certain characteristics of their own which will be briefly described.

Gold and silver prevail, though compared to the deep-seated veins with quartz gangue there is more silver, and the native gold is, as a rule, present in much more finely divided form. Pyrite, galena, zinc-blende, chalcopyrite, arsenopyrite, argentite, and stibnite are the prevailing ore minerals, but more complex sulphides, sulph-antimonites, and sulph-arsenites, such as ruby silver, stephanite, polybasite, etc., are more abundant than in deep-seated veins. In part their presence may be due to a secondary enrichment by descending solutions, but opinions do not as yet agree regarding all of these occurrences. Of gangue mineral quartz prevails, but it is here often accompanied by chalcocony, opal, or other

forms of silica. Calcite and dolomite are moderately abundant in the vein-filling, while siderite occurs more rarely. Barite and fluorite predominate locally. Magnetite and specularite, as well as the whole line of the silicates belonging to the greater depth of formation, are absent. Apatite is of rare occurrence. On the whole, as may be expected near the surface, the filling of open cavities is a process of much importance.

The metasomatic processes differ, in character of course, in different country rocks. In igneous rocks of medium acidity a strong sericitization is apt to take place immediately adjoining the vein with attendant concentration of potassium and leaching of lime, iron, and magnesia. Pyritization is also of common occurrence. The solutions appear to have been poorer in carbon dioxide than those of the deep-seated deposits, and extensive carbonatization is therefore less common. On the other hand, the solutions have a tendency to spread from the veins through large areas of adjoining rocks, probably owing to more extensive fissuring near the surface, and here, robbed of their most active ingredients, they produce the so-called 'propylitization,' which consists in the development of chlorite and epidote, as well as pyrite, from the dark silicates, and in the eventual degeneration of the feldspars into quartz, chlorite, and epidote.

In very basic rocks this propylitization may proceed closely up to the veins, but as stated above, sericitization is likely to take its place. Complete silicification of the wall-rock is more common in these deposits than elsewhere. In large altered areas irregular masses of completely silicified rocks are often met with. These products of replacement are usually dark gray or brown, and fine grained, flinty or cherty rocks. Silicious rocks like rhyolite are especially subject to this irregular silicification.

In calcareous rocks the products of replacement along these veins are usually fine grained quartz or chalcedonic jaspers and cherts.

The majority of cinnabar deposits — whether in veins or irregular masses — are also formed at no great depth below the surface. This does not imply that mercury is only precipitated near the surface, as advocated by some, for many of the ore deposits of the deeper zones contain this metal, occasionally as cinnabar, but more frequently as mercurial tetrahedrite or as telluride of mercury (kalgoorlite). The principal ore minerals of cinnabar deposits are, besides that substance, marcasite, pyrite, stibnite, all minerals susceptible of formation at slight depths. The metasomatic action on serpentine and other basic rocks consists in carbonatization (dolomitization), and silicification, opal and chalcedony being especially abundantly formed.

(C) MINERAL DEPOSITS FORMED AT THE SURFACE BY HOT WATERS.

Mineral deposits may be formed at the very surface by hot springs, but they are then rarely of economic importance. A great number of minerals may result by direct deposition or by metasomatic action. All of the earthy carbonates contained in the water are here deposited at once, as sinter; the silica also as opal or chalcedony. The ordinary spring deposits thus consist of a mixture of carbonate and chalcedonic or hydrous silica. Calcite, fluorite, barite, celestite, and many other gangue minerals may also develop in crystallized form.

Of ore minerals stibnite, pyrite, marcasite, and cinnabar are known in crystallized form, and many other sulphides have been detected chemically in the deposits. Zeolites are sometimes observed as products of

rock alteration by mineral waters at the surface. Some sericitization of feldspathic rocks also takes place.

In most cases surface water containing atmospheric oxygen has acted on the sinters deposited at the surface or on the upper part of the veins. A complete change in the character of the deposits is effected by it. While under the influence of hot ascending waters practically no minerals rich in water form, and even zeolites are almost unknown, here, on the contrary, highly hydrated minerals are the rule. Limonite, and the whole series of hydrous oxides, carbonates, and sulphates of the heavy metals prevail among the ore minerals and kaolin, allophane and chloropal among the gangue minerals.

Kaolin has not been mentioned among the gangue minerals of any class of deposits except those formed or occurring under oxidizing influence, although the writer is well aware of the very general opinion to the contrary.

CONCLUSIONS.

The review given above indicates an almost unbroken series of deposits in which, in successively higher or cooler zones, the mineral combinations gradually change from those of pegmatitic and contact metamorphic conditions to those known to obtain at points where hot springs issue at the surface.

The contact metamorphic deposits have recently been connected with those of the lower vein-zones by the discovery that some of the latter contain silicates and other minerals supposed to be characteristic of the former. Under heavy pressure minerals of small molecular volume tend to form from solutions, and naturally this tendency would be most strongly indicated in those ore deposits which are contained in calcareous rocks. At the highest temperatures and pressures obtaining the solutions do not readily attack the feldspar and dark silicates of surrounding crystalline silicate rocks, although some of the *agents mineralisateurs* may penetrate them and deposit minerals like tourmaline and topaz. This seems to be the chief and not yet thoroughly understood difference between contact metamorphic deposits and even the lowest vein-zones in which the feldspars are unstable and are at once attacked under formation of various minerals. The ilmenite, spinel, amphibole, pyroxene, scapolite and biotite of the lowest vein-zones are missed in the upper zones in which sericitization and carbonatization prevail. The behavior of epidote is peculiar in that it is characteristic of the contact metamorphic deposits and the lowest vein-zones, while it is absent in middle depths, only to appear again in some veins near the surface.

The general character of the solutions as we know them from the deposits at middle and upper vein-zones is unquestionably alkaline, that is, they contained the alkaline carbonates as one of their principal constituents. There seems to be no evidence at all of the presence of such reagents as free sulphuric, hydrochloric, or hydrofluoric acid. At high temperature and pressure the behavior of the solutions changes in a marvelous degree, but in view of the scarcity of experimental data it is hardly profitable as yet to discuss their constitution and mode of action.

It is not to be assumed that the solutions which formed the mineral deposits always had the same general composition. Within certain limits they doubtless varied greatly. While there are numerous analogies which tie together the pegmatites and the cassiterite veins as both characteristic of acidic intrusion of normal granite, there seems to be no such evident connection between pegmatite dikes and gold-bearing veins. On the contrary, it appears that the intrusive granular and porphyritic rocks with which most of the auriferous veins are connected are remarkably deficient in pegmatitic dikes.

Production of Spelter.

The United States Geological Survey has issued a preliminary statement covering the production of lead in 1906. This has been prepared by J. M. Boutwell.

Production of spelter in the United States, tons	1905.	1906.	Increase in 1906.	
			Quantity.	%
Production of spelter in the United States, tons	203,849	224,770	20,921	10.3
Consumption of spelter in the United States, tons	200,438	221,781	21,343	10.6
Production of spelter in the world, tons	727,141	775,871	48,730	6.7

PRODUCTION OF SPELTER IN THE UNITED STATES IN 1906.

APPORTIONED ACCORDING TO SOURCE OF ORE.			
Locality.	Quantity.	Locality.	Quantity.
United States—	Tons.	United States—	Tons.
Arizona	64	New Jersey	11,206
Arkansas	1,801	New Mexico	555
Colorado	32,456	Tennessee	124
Idaho	573	Texas	8
Illinois	282	Utah	2,419
Iowa	201	Virginia	1,113
Kansas	3,902	Washington	7
Kentucky	335	Wisconsin	11,057
Missouri	130,348	Total, domestic	190,634
Montana	1,415		
Nevada	1,768		
Foreign—			
British Columbia			201
Mexico			21,875
Total, foreign			25,076
Grand total			224,770

APPORTIONED ACCORDING TO LOCALITY IN WHICH SMELTED.

Locality.	Quantity.
Colorado	6,290
Eastern and Southern States	29,930
Illinois	47,939
Kansas	129,561
Missouri	11,077
Total	224,770

CONSUMPTION OF SPELTER IN THE UNITED STATES IN 1906.

Supply—	Tons.
Stock beginning of year	3,463
Production	224,770
Imports for consumption	2,043
Total available	230,276
Withdrawn—	
Stock at close of year	3,824
Exports, foreign, in bond	1
Exports, domestic	1,675
Total withdrawn	8,499
Apparent domestic consumption	221,781

WORLD'S PRODUCTION OF SPELTER.

Country.	Quantity.	Country.	Quantity.
Australia	1,131	Poland	10,595
Austria and Italy	11,883	Rhine district	75,729
Belgium	168,067	Silesia	150,282
France and Spain	59,283	United States	224,770
Great Britain	57,971	Total	775,871
Holland	16,150		

L. VOGELSTEIN & Co., New York, give the following figures of German consumption of foreign copper for the period January to June, 1907:

Imports of copper	Tons.
Exports of copper	59,637
Total consumption	4,130
As against a consumption during the same period in 1906	55,507
	61,115

Of this tonnage 45,776 tons were imported from the United States.

EXPERIENCED drill sharpeners often gauge the bits by the eye only, but it is advisable to make use of a gauge in sharpening the steel, as there is nothing more aggravating than trying to find a drill to follow one with a small bit. Many foremen are extremely careless in regard to the steel which they furnish to their miners, and the result is poor progress and dissatisfied employees.

Decisions Relating to Mining.

Specially Reported for the MINING AND SCIENTIFIC PRESS.

A mining lease provided for a certain royalty on the coal mined, and that the mining should commence within one year, but in the event that it did not, there should be paid as advance royalty for the first and second years a specified sum; and it was guaranteed that after the second year the royalty should amount to as much as a stated sum during the contract, or until all minable coal was removed. Where no coal was mined during the first two years, but the advance royalty was paid, it was held that such advance royalty should be applied on the royalties first actually earned thereafter, and the lessor was not entitled to have such royalties applied, if at all, only on the excess actually earned over the royalty guaranteed.

Kissick v. Bolton, (Iowa) 112 N. W. 95. (June, '07.)

Under a statute providing for the appropriation of lands for public use without the consent of the owner, and providing that the title should remain in the owner subject to the use for which it was taken, the owner of land taken for a right of way of a railroad, had the right to remove coal from under the right of way and to connect such coal by tunnels, but in so doing he must not impair the surface for the use of such right of way by removing the support.

Eldorado &c. R. Co. v. Sims (Ill.), 81 N. E. 782. (June, '07.)

The owner of a coal mine was held liable for injuries to a servant caused by an explosion of dynamite in the roof of the mine, placed and ignited by timbermen, whose duty it was to keep the mine roof in safe condition. And it was competent to prove the customary hours for firing shots by the timbermen in the entries of the mine, and that they were not usually shot at the time when the miner was injured, thereby showing that the injured miner exercised due care and that he had no reason to expect danger from such a source.

Dunk Bros. Coal &c. Co. v. Thill (Ill.), 81 N. W. 857. (June, '07.)

A pumpman engaged at the bottom of a shaft in a mine, who knew that the shift-boss performed the duties of inspector, thereby assumed the risk of the inspection system under which the mine was worked.

Williams v. Verona Min. Co. (Mich.), 112 N. W. 496. (July, '07.)

A pumpman engaged at the bottom of a shaft in a mine was held to be a fellow-servant of the brakeman in charge of the hoisting cage, and that the mine-owner was not liable for the death of such pumpman by reason of the negligence or wrongful act of such brakeman.

Williams v. Verona Min. Co. (Mich.), 112 N. W. 496. (July, '07.)

The lessee of a mine obligated himself to pay the lessor a fixed royalty per month; but the payments were to be made to a certain bank and to be applied on the indebtedness of the lessor, which indebtedness was secured by a mortgage on the mining property. In an action by the lessor to recover the unpaid royalties, it was held that the defendant could not claim that the bank was a party in interest, and that the action should have been in its name.

Nickel v. Hodgins, (Mont.) 90 Pac. 757. (June, '07.)

A statute authorized liens on mines in favor of laborers and material men, but provided that it should not apply to the owner when the mine was worked by a lessee, if a copy of the lease was recorded in the mining records of the county before the work under the lease was begun. In the absence of a statutory definition of 'mining record' or of any designated record in which such instrument should be recorded, it was held sufficient to record such lease in a book kept by the County Clerk for the recording of leases and instruments effecting the title to mining claims, and which was designated 'mining conveyances.'

Slover v. Bailey, (Ore.) 90 Pac. 665. (June, '07.)

Gold Mining in Egypt.

Written for the Mining and Scientific Press
By C. S. HERZIG.

The romance of Egypt attracts the gold miner. Every old path winding over the hills he passes causes him to wonder how old it is; where did it lead to; who made it; and why? And to each of these old hill-paths he assigns a romance of gold worked in the distant ages before Christ. In the Bible, and in history, we read of the fabulous wealth of the ancient kings, and it is a common thing to hear people say that with our greater scientific attainments, and our modern methods, we should be able



General View of the Country.

to work mines that the old-timers were unable to touch. But that is a great fallacy, born of lack of knowledge, and the vanity of modern man! If we look back into the history of Egypt, we can trace at least three different epochs of mining in the country:

- 1st.—There was the epoch of the ancient Egyptian and Phenician living in Biblical times;
- 2nd.—That of the Roman, during his occupancy of the country;
- 3rd.—That of the Arabs and other Musselmén. (1



On the Road to the Nile Valley Mine.

have seen an inscription on the rocks at a mine I visited, dating back to the Mohammedan year 505, or 819 years ago.)

What the length of each period was, how many years or hundreds of years, it is impossible to state. One thing is certain, namely, that mining was carried on from the earliest times. There is an authentic history to that effect for fully 4,000 years. Gold was more sought after in ancient times than now, and before its discovery in California, less than sixty years ago, the world's production was only a small percentage of the present output.*

*For the 10 years preceding the California rush, the gold output of the world was only about 2½% of the present annual production, and prior to 1840 it was still less.

The farther back we go, the greater is the comparative value of the precious metal, and in the period of the Romans its purchasing power was probably a thousand times as great as it is today. This is the first important consideration affecting the probable value of ores worked by the ancients.

Before the invention of gunpowder the usual method employed for breaking ground was building a fire against the face; and therefore we usually jump to the conclusion that only very rich ore could stand the expense of such slow treatment. However, this is only one factor of the problem, for the mines were worked by slaves, the principal cost of whose maintenance was their food. Their clothing consisted of a little more than a breech-cloth, and that item could not have figured heavily in the total cost of maintenance. Moreover, the ancients' knowledge of mining and metallurgy, all things considered, does not suffer badly by comparison with our own.† They did not have recourse to the cyanide and other chemical processes, so widely applied at present; but, ages ago they practiced what is considered one of the greatest of recent advances in the treatment of gold ores, namely, fine-



Egyptian Grinding Mill.

Top stone on left; nether stone to the right.

grinding. They knew neither tube-mill nor Wheeler pan, but labor was cheap, and they accomplished the same result by grinding their ore between stones, usually of granite, and worked by manual labor, and then catching the gold on crude tables built of rock, 8 to 10 ft. long, about 3 ft. wide, and sloping sufficiently to let the water flow off freely.

At a mine I recently visited I took a sample of old tailing, and a screening test showed the following results:

Retained on 100 mesh	1.85 per cent.
Pass 100 mesh retained on 160 mesh	4.40 "
Pass 160 mesh retained on 200 mesh	5.75 "
Passed 200 mesh	88.00 "

From this it is evident that the sliming of gold ore has been accomplished in the earliest of times, and with oxidized ores the ancients must have recovered practically all the gold, except, perhaps, the very lightest particles, as nearly 94 % of the above corresponds to the present-day definition of 'slime.'

Whatever happened before or after, it is certain that the Romans brought great skill to bear in their prospecting and mining operations, for they were the teachers of the Spaniards, who in turn conquered and taught the

†The ancient Egyptians, as is well known, possessed the secret of tempering copper, now lost to us. Nothing but the old tailing remains as evidence of their knowledge of gold metallurgy.

Spanish-American and Mexican. And the Mexican is, in my opinion, the best prospector and ore-sorter on earth. And his teacher was, indirectly, the Roman, who, among other things, worked nearly all the copper mines at present known to exist in Spain. It is therefore likely that they roasted pyritic ores in order to free the contained gold, where this method was efficacious. The advances that have been made in modern times in the treatment of free-milling ores have been largely mechanical, although

us, and we must inevitably draw the conclusion that the economic conditions existing now are so different to those prevailing in former times that the risk assumed in reopening an old mine is too great to warrant the capital required.

In Egypt, no virgin lodes of gold ore have been discovered within years, and if the mining industry is to have a future in the country, it will be due to the opening up of a mine whose existence has hitherto escaped the borders of prospectors that scoured the country from the southern Sudan to northern Egypt long before the present European invasion.

The country is divided into concessions of large area, there being thousands of square miles in each. However, these large concessions are being canceled as rapidly as possible. The Government is framing new mining regulations, with the intention of throwing the country open to prospectors. But the difficulties to be encountered by men prospecting in Egypt are even greater than those existing in the desert country of Western Australia.

In Egypt, the country is not only a desert without water or fuel, without established means of communication, and without villages or towns where one can get fresh supplies; but the inhabitants of the country are

due credit must be given to the use of quicksilver and other chemicals used about a stamp-battery.

In ancient times the quantity of ore treated was small, as manual labor took the place of the modern power-plant. However, the miner could afford to do a large amount of dead work underground in order to find a pay-shoot, because when he did uncover one it repaid him for months of unremunerative labor. It is well to point out that this condition does not exist today.

It would be difficult to estimate the amount of money that has been expended by English and other foreign companies in endeavoring to find a mine in Egypt. However, the first profitable mine has yet to be discovered. Thousands of pounds sterling have been sunk, and a great many ancient workings reopened, all with negative results. This fact, and the points discussed above, lead me to the conclusion that the ancients were able profitably to work mines which, with all our scientific attainments, would not be payable at the present time. The biggest output of gold from recent workings was from a rich shoot found by the Nile Valley Co. But the total amounted to only about £100,000, which was put back into the mine, together with all the subscribed capital. One mine after the other is shutting down after an unsuccessful career, not one having paid a dividend, and of those still working the prospects are not too bright.

If we consider the gold romance of Egypt in this light, we shall not be ready to spend money in large sums on every ancient hole in the ground brought before

a colored race who do not speak our language, who have a religion which makes them antagonistic to the foreigner, and who—owing to the political condition of the country—are inclined to resent his presence. Again, the native considers that he is justified in swindling the



Loading the Caravan After the Noon-rest.



A Pile of Old Grinding Stones.

white man in every business transaction, especially if the white man does not speak the language well, or is not in the Government service. In other words, the only individuals who can expect anything like decent treatment from the natives, are the Government officials and the military. Even in the 'back blocks' of a country like Western Australia the amount of supplies which a prospector requires to carry is comparatively small, as he can pick up stores at fairly frequent intervals, and is always sure of a meal wherever there is a habitation. On the other hand, in Egypt, if a man starts prospecting in the desert he cannot get along with less than three

camels, and probably two natives. This means an expensive outfit in first cost, and a considerable expense in maintenance, as he must carry food for his camels, and food and water for himself and his Arabs. Therefore, it precludes the possibility of a prospector without financial backing undertaking any exploratory work. Then, if a mine be found, there are still all the drawbacks to the successful outcome of operations, due to the reasons stated above, namely, the lack of water, of fuel, of transport, and scarcity of labor.

The workmen are indentured on short terms, and the following is a form of a contract which was entered into by a company operating in the country, the terms being arranged by the Government Inspector of Mines:

CONTRACT

Between Mr. Blank, of the A. B. S. Mining Company, and the undermentioned workmen:

Mr. Blank agrees as follows:

1. To pay the following minimum rates, with a sliding scale for hammermen, making it possible for good workmen to earn up to 6½ piastres per day.

RATES OF PAY.

	Minimum...	*5 P. T.
Hammermen.....	"	5
Laborer, underground.....	"	4
Laborer, surface.....	"	4

2. To provide men with rations and all traveling expenses, including camels for transport of their goods and water to the place of work.

On the completion of the contract he will provide the same means of returning. This will also apply to any man becoming incapable through no fault of his own, either by the act of God, illness or accidents, at the manager's discretion.

3. To pay monthly, not later than the eighth of each month.

4. To supply rations as or equal to the Government standard.

The men agree as follows:

1. To work for (4) four months from the date of arrival at the working place.

2. That any man proving incapable of doing a fair day's work as hammerman shall be put to work as laborer, either underground or at surface.

3. Each of the undersigned hereby acknowledges the receipt of 50 P. T. advance, to be deducted from his pay during the first two months equally.

RATIONS WEEKLY.—14 lb. flour, 1½ lb. lentils, 1½ lb. rice, ½ lb. onions, with ¼ lb. each of salt and butter.

It will be noted that this contract is a one-sided affair. As the natives are independent, and the Government paternal, efficiency is not high, and the cost for the work that is done is great.

Without entering into a discussion as to the reasons or the statement, I feel that a mine, to pay in Egypt, will require to have a vein of good stoping size, and an average value of at least an ounce to the ton.

NICKEL IN CAST IRON.—In determining the effect of nickel on cast iron, 20 test bars, 10 with the nickel added and 10 without, all from the same ladle, holding 1,400 lb., and of good hot iron. Nickel thermit was put into the bottom of the hand ladles, the aim being to get varying proportions of the nickel into the metal and then to note the results of the tests. The results did not indicate a marked improvement in the physical strength of the castings, and bear out the supposition that nickel in cast iron is either not distributed uniformly enough to do much good, or else will find its best use in special classes of the metal free from the high percentages of impurities incident to the ordinary casting.

A Broad Apex.

A reader wants to know "if the apex law will hold on replacement deposits of copper in which the lime formation and included deposits along the bedding planes of the former dip at an average of 42°; or, if the side lines, continued vertically downward, limits the area of each claim, in which the ore may be followed on the dip."

If the United States mining laws were framed on the lines of obvious common sense, this inquiry might be answered categorically. But unfortunately, for the layman at least, some of the provisions of these laws are like those of the Medes and Persians—small characters written on high pillars. It requires a vast amount of climbing to read them intelligently and coherently and an inspirational gift to interpret them.

These laws were framed at an early period in the lode-mining history of the West. The conception of the miner at that time as to what constituted a 'lode' or 'vein' was simple and easily definable. The quartz veins of California, the supposed filling of a comparatively small fissure with gold-bearing quartz having well-defined walls, course, and dip, were undoubtedly the ideals on which the first mining law was framed, and upon the existence of which "the law of the apex" was predicated.

These ideal veins have proved to be the exceptions; irregularity of deposits is the rule. It may be said that in contemplation of the law, deposits in place carrying metals or mineral substances of commercial value are 'lodes' or 'veins.' That such lodes or veins have boundaries, strike, and dip; they also have an 'apex' upon the existence of which within the boundaries of a location the 'extra-lateral right' depends. It took many years of hard judicial effort to define what an 'apex' was. After the definition became fairly recognized, it was discovered that the top of the lode or vein was sometimes wider than the area allowed by law for side-line purposes, in fact wide enough to accommodate an indefinite number of locations. Then there came a time "when chaos umpire sits and by decision more embroils the fray." There were cases of "broad veins," bisected "apexes," and conflicting underground rights. The ingenuity of Court, counsel, and expert was taxed to solve the problems. Over in Colorado the tribunals started out with the view that unless a locator had the entire top of the deposit within the vertical boundaries of his claim he had no right of lateral pursuit. But Utah declined to follow this doctrine. Its Courts held that the location of any part of the apex of a broad lode carried with it the extra-lateral right and conflicting underground rights were to be settled by priority of location. In Leadville, where the deposits were replacements in approximately horizontal position with occasional exposures through erosion, the Courts held that the deposits were veins and necessarily had an apex somewhere. The unwritten "common law" of this district, however, as expounded by the juries of the vicinage, smothered the extra-lateral right and no extra-lateral right claimant in that part of the world ever succeeded in a lawsuit. The Utah rule has been sanctioned by the lower Federal tribunals. The Supreme Court of the United States has never passed upon the question. It has had several opportunities, but has thus far succeeded in avoiding a decision. The question is now before it in the case of *U. S. Mining Co. v. Lawson*, on appeal from the Supreme Court of Utah.

The difficulty comes from the necessity of treating the mining laws as a bed of Procrustes. There must of necessity be many misfits, and the "broad lode" is one of them. If we had our way about it, there would be no extra-lateral privileges attaching to zones or belts of mineralized rock, such as are described in the inquiry.

*A piastre is worth about 2½ pence or, say, 1½ cents.

The Uses of Copper.

The average man, if asked to name, offhand, the uses of copper, would be likely to reply that the metal was used mainly for coining pennies and making wire, yet



C. S. Herzig Aboard the Ship of the Desert.

these uses employ barely more than a quarter of the copper that is produced. On second thought he might smile at naming copper coinage as an important consumer of the metal, yet his first thought would be nearer right than his second, for the Chinese Empire has used 50,000 tons of copper for making new coins, within the past two years, thereby increasing the circulating medium of the country to the extent of four ounces for each inhabitant—for while 50,000 tons of copper is a large quantity of metal, sufficient to load 1,000 freight-cars of the heaviest type used on American railroads, it is but a quarter of an avoirdupois pound per capita, when divided between 100,000,000 people.

Only the expert, or those engaged most actively in the copper industry, have the slightest idea of the diversified uses to which copper is put, as shown in 'The Copper Handbook,' by Horace J. Stevens. According to this book copper enters into almost every form of human activity, and the multiplicity of its uses is most surprising. Electric light, power, and traction are immense consumers of the metal in the form of wire, and telephones and telegraphs find it indispensable, yet electricity requires only a trifle more than a quarter of the metal made. The engineering trades consume more than half of all the copper produced, mainly in the form of brass, but there are about a score of friction metals and alloys, each having its specific use, into which copper enters as a component part.

The building trades are enormous consumers of copper,

and this sort of consumption is increasing rapidly. Copper roofs, cornices, and fronts adorn the exteriors of business buildings in thousands of towns, while for interior work the great majority of modern buildings use copper, brass, or bronze locks, knobs, and butts. Brass pipes, nicked, are in modern bath-rooms and lavatories, and brass and bronze chandeliers, gas and electric fixtures are almost invariable. A dozen or more other very common domestic uses of copper are mentioned.

In the manufacturing world the uses of copper and brass are innumerable. One concern in the Naugatuck valley of Connecticut buys copper in ten-ton lots, monthly, solely for the making of watch-dials, all of the better-grade dials being of copper, enameled. The common pin requires hundreds of tons of copper yearly, insignificant as a single pin may seem. Bells for shoes and tips for shoe-laces require metal by the scores of tons, and the thin metallic tips on rubber-tipped lead-pencils are responsible for a surprising depletion in the stock of the metal.

In addition to the consumption of the metal itself, tens of thousands of tons of copper sulphate are required for the arts and manufactures, and for horticultural purposes, in spraying fruit trees, bushes, and vines.

USES OF QUICKSILVER.—The principal use of quicksilver is in the amalgamation of silver and gold ores. The demand for this purpose practically regulates the price of the metal. Considerable quantities are also used in the manufacture of a vermilion pigment, but this industry is suffering a decline occasioned by the competition of cheaper, but inferior red of the vermilion shade made with aniline dyes. In industrial chemistry quicksilver is used to quite an extent as an electrode in various processes. For example, in the manufacture of caustic soda a solution of common salt is subjected to electrolysis, and the metallic sodium set free combines with the mercury electrode, forming sodium amalgam, which when treated with water liberates sodium hydrate. Small quantities of quicksilver are used in medicine, as calomel or corrosive sublimate; as tin amalgam in the



West Australia and Egypt Side by Side.

manufacture of mirrors; for coating the zinc plates of electric batteries; as gold, copper, or zinc amalgams in dentistry; in thermometers, barometers, and various other scientific apparatus; and in electrical machinery where moving or liquid contacts are desired. A new use for the metal is in the mercury vapor electric lamp.

The Use and Care of Mercury.

Mercury is a metal that is liquid under ordinary temperatures and to this property it owes its other name, quicksilver, where quick means lively. The alloy of mercury with another metal constitutes an 'amalgam'; it is an alloy formed, in some cases, without the aid of extraneous heat, although in others the union is accompanied by evolution of heat and a modification of the mean properties of the components.

It often happens that mercury works unsatisfactorily in the battery or rifles. The following are some of the causes of the flouring and sickening of quicksilver, and various methods of remedying the evil.

Impure mercury is easy to recognize when trying to work with it, as it gives poor results. It may be recognized by shaking a small amount in a bottle, when a black film will form. If mercury is impure, when it is caused to roll down an inclined surface of glass or paper, it will do so in pear-shaped globules, having tails, and will leave a blackish film behind; it will leave a film on rough white blotting paper. If but $\frac{1}{4000}$ part of lead be present, a thin film will adhere to the glass plate. It is only pure mercury that forms an approximately true sphere.

Liquid mercury does not adhere to any substance except such metals as it readily amalgamates with. It 'wets' these metals, forming a thin adherent film on them, but when brought into contact with other substances, its surface tension comes into play and it forms spherules or takes a convex surface. Pure mercury is unaffected by air at ordinary temperatures, but will be slowly oxidized if it is heated to about 350° C. No commercial mercury is entirely pure, often containing traces of foreign metals, especially the more volatile ones, such as lead and zinc. Re-distillation will not effect a complete separation from them, as some part will always distill over with the mercury. To avoid this effect, some people recommend distilling at a low temperature in a current of superheated steam.

Although simple distillation will never completely remove impurities, a partial cleansing may be achieved in this way, and in this connection it is well to hint that care must be taken in distilling mercury as it is quite a different problem from retorting amalgam, and must be carried on slowly, and at a low temperature. When small quantities of lead or zinc are present, the mercury distills more slowly than when pure, although other metals do not seem to produce this result. One plan for producing the maximum cleansing effect by distillation is to collect the bulk of the distilled mercury in one vessel, and then, before applying the final heat, to divert the condenser-pipe into another vessel, keeping the last 10% separate from the rest, as it will carry most of the impurities.

Mercury forms an amalgam directly with gold, silver, copper, lead, bismuth, tin, and cadmium. It unites with antimony and arsenic only if heated. Iron amalgam is formed directly only if the iron is finely divided. Amalgams of nickel, cobalt, manganese, chromium, aluminum, and platinum are not formed directly, but may be formed indirectly by the electrolysis of their salts with mercury as their negative poles. Amalgams of sodium and potassium are formed directly with the application of a little heat. Since impure mercury will not act upon gold, even though the gold be in a perfect condition for amalgamation, it is important to use clean mercury in ordinary amalgamation processes, in order to reduce the losses as far as possible, although some millmen think that zinc or cadmium amalgams catch gold remarkably well.

Even though the gold and mercury be in perfect condi-

tion for amalgamation, and have amalgamated, excessive stamping, agitation, or grinding, may bring about the granulation of the amalgam and leave it in a condition to be readily floated away. When it is separated into these minute globules by mechanical causes it is said to be 'floured,' and if the particles cannot unite because of the coating of finely powdered substance, and this state of fine subdivision is thus made permanent, it is 'sickened.' In stamp-mills and grinding-pans the metal linings and crushing parts wear into minute particles that coat the mercury. Thus sickening may be due both to chemical and mechanical causes. The varnish on the battery screens may have a bad effect. Grease from bearings and candles must be avoided. For this reason plumbago and molasses has been used as a lubricant around the battery. Bad effects are sure to follow if exhaust steam is used direct to warm the battery-water, on account of the cylinder-oil. Organic impurities are deleterious. Vegetable or animal oils have a worse effect than mineral oils. Babbitt metal, lead carbonate, and even graphite may cause a sickening of the mercury in the battery. Trouble from grease may be remedied by the use of soda ash, lye, or burned lime in the mortar, and potassium cyanide is used to clean plates and promote amalgamation, as it removes oil, grease, and base metallic oxides.

There are many other causes for the sickening and flouring of quicksilver. Base metals associated with gold invariably coat the surface of the gold particles and prevent amalgamation. Native arsenic, copper, antimony, or bismuth reduce the value of the amalgam and interfere with the amalgamation. Arsenic and native sulphur make the mercury 'sick.' In the battery, the sulphide of antimony is one of the worst minerals to deal with, as it divides the mercury into a black flour, and this cannot be corrected by the use of sodium amalgam. Native antimony is not very injurious as it amalgamates readily, but causes a bulky clean-up. Tellurium is an enemy to amalgamation, and lead has a bad effect. The partial decomposition of some base minerals in refractory ores produces acidulated water, causing the mercury to granulate. An acid sulphate of iron arising from the decomposition of copper, or iron sulphides, or arsenical pyrite is injurious, but this is often corrected by the addition of quicklime to the battery.

All unctuous substances, as clay and talcose material in the ore, also the oxides of iron and manganese, promote the flouring and sickening effect, which appears to be the result of the physical presence of these substances, and not to a chemical action. Continuous stamping, agitation or grinding, causes mercury to form into minute globules that collect fine films of matter and air particles on their surfaces so as to prevent reunion of the globules, destroying the capacity of the mercury for amalgamation, and reducing the relative weight of the globules so that they are carried off by the water.

Potassium cyanide, sodium amalgam and other reducing agents tend to produce a reunion of the particles of floured mercury, possibly on account of the action of the nascent hydrogen on the mercury. An electric current may have the same result and muntz metal plates have been recommended because of a feeble galvanic action, electrolyzing the water, liberating hydrogen, and reducing the oxides that coat the mercury particles. It is accepted as a fact that in amalgamation on the plates or in the mortar or pan, free metals and dissolved salts are absorbed, and insoluble compounds of the heavy metals are reduced and amalgamated in part by galvanic action; in this action, the copper of the plates, or the iron of the mortar or pan constitutes the positive element, and all metals less oxidizable than this reacting metal are reduced by it and are then amalgamated by the mercury.

If lead is introduced into the amalgam the latter becomes pasty, and copper has an equally harmful effect.

Sodium amalgam has a strong reducing action and is used to rehabilitate sickened mercury, and keep it in good condition. It tends to reduce to the metallic form the oxides, sulphates, sulphides, and chlorides of base metals that coat the mercury globules, but this action causes the base metals to go into the quicksilver and may do more harm than good. For this reason the use of sodium amalgam is not generally recommended; for while the mercury is made bright again and the finely divided particles are able to coalesce and amalgamate gold freely, still there is no permanent purifying action, since the base metals have merely passed into the mercury and are soon oxidized again, when the process must be repeated. Sodium amalgam is made by heating a vessel of mercury to 300° F. and dropping in pieces of metallic sodium not larger than a pea. When these pieces touch the mercury there is a slight explosion and a bright flash of flame, until about 3% of sodium has been added, when the action becomes less pronounced. Then the amalgam is poured on a plate to cool and solidify, and when hard is broken into pieces and kept in a bottle under naphtha. If it is used in the battery, the procedure is generally to add it in such amounts that the mercury will adhere slightly to the brightened edge of a nail. If it coats the nail all over, too much sodium has been added and more mercury will have to be fed in, or if it does not adhere at all to the nail where it has been filed bright, more sodium amalgam may be used. While it is considered to have apparently little value when fed into the mortar in this way, still it is used in amalgamating pans, or in rittles, or mercury wells, or in cleaning retorted mercury, or wherever it can act directly on a considerable amount of mercury. Electric currents and galvanic couples have a reducing effect similar to sodium amalgam.

If it seems best to attempt the purification of foul mercury by distillation, choice may be made of several methods. It may be distilled in a capacious retort, like a cinnabar retort, under a layer of cinnabar. The sulphur of the cinnabar combines with the foreign metals and prevents their passing over with the distilled mercury. Or it may be retorted similarly under a layer of quicklime or iron filings. In this case the iron filings prevent bumping and splashing and decompose the sulphides, and all the arsenic or sulphur liberated is absorbed. The retort should never be more than half-full of mercury and the distillation should proceed slowly. Charcoal may be added in the retort to prevent the volatile oxides from passing over. At best, some lead and zinc will probably go over with the mercury.

It is generally better to employ a chemical method of purification. Small quantities of mercury can be partially cleansed by vigorous shaking in a bottle not more than one-quarter full, with some crushed granulated sugar, subsequently filtering through a cone of heavy blotting paper with a small hole at the apex. This method of filtration is useful in removing any suspended impurities. Small quantities of impurities such as lead may be removed from mercury by keeping it for some hours in a vessel under dilute nitric acid, occasionally stirring the mass. This acid dissolves the lead and copper, and some mercury, but the mercury is precipitated again when a fresh charge containing lead or copper is treated with the acid. The last of this dissolved mercury may be recovered by adding a piece of metallic copper to the solution. Pure mercury is not attacked by hydrochloric acid, and only slightly by dilute sulphuric, but it is acted upon by hot concentrated sulphuric acid or by cold dilute nitric acid, and is rapidly dissolved by hot nitric acid. Therefore, zinc, tin, copper, and iron may

be removed by shaking the mercury with dilute hydrochloric acid. In fact, if mercury is placed in a vessel and allowed to stand for some time under a 1 to 3 dilute solution of hydrochloric acid, it will be gradually purified, especially if stirred occasionally. Small amounts of impurities can be eliminated by treatment in this way with potassium cyanide, caustic potash, or dilute acids. The purified mercury is best kept in an earthenware, glass, or porcelain vessel, under a layer of weak potassium cyanide or nitric acid, the quicksilver being drawn off when needed, from the bottom, through a stop-cock, and washed in water before using. Acidulated water may be added to the vessel if the nitrate of mercury encrusts the surface. The elimination of the base metals may be hastened by passing a stream of air through the mercury under this acid cover, as the foreign metals are oxidized by the air and dissolved by the acid. A cleansing method that has been recommended is to wash the mercury in a bath made by dissolving one tablespoonful of potassium cyanide and two tablespoonsful of ferrous sulphate in a gallon of water. An efficient method for removing zinc and tin is to let the quicksilver trickle in a fine spray down a 3 or 4-ft. column of ferric chloride solution. Agitation with strong sulphuric acid and potassium chlorate has been successfully used; digestion with ferric chloride removes the zinc and tin, and heating with a solution of mercuric nitrate will dissolve the foreign metals as nitrates, the mercury being precipitated. If greasy or resinous impurities are present, some operators wash the mercury in a strong solution of alkali, made from wood ashes.

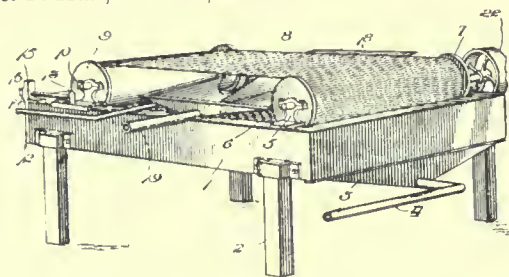
STEEL PASSENGER CARS.—The development of all-steel passenger cars has been much slower than steel freight cars. This was probably due to the fact that steel freight cars were required to carry a greater load and not increase the dead weight, a little experience having taught that 40 tons or over was too great a continual loading for a wooden car. In passenger car construction the question is different. It is true that present passenger coaches are somewhat longer and much heavier, and will resist impacts that would have wrecked cars built 10 years ago. But they are operated at higher speeds, so the average passenger coach today is relatively no stronger than the old-fashioned cars. For high-speed service it is practically essential to use a steel car, if the safety of the passengers is considered. The force of impact in a collision will splinter the sills, posts, and side plates, and a passenger caught in the wreckage of a wooden car has not much chance, particularly with the addition of a fire. Aside from the question of accidents, steel passenger cars should be a good investment, as the running repairs are less, the car being out of service a shorter time when going through the renovating process, and the steel surface is easier to finish than the wood and does not require so much care, and, with steel freight car experience as a guide, the life will be much longer.

MINING IN FORMOSA.—The principal coal mines of Formosa are situated in the Keelung district. The output for that district for the first six months of 1906 was 29,643 tons, valued at £9,820. Copper ore has been discovered at the Kinkwaseki gold mines, Keelung district, and work has been commenced on it. There are at present 21 coal mines. The majority are merely tunnels run into the side of the mountains, and there are only two or three which produce coal of good quality. The Denryoko coal mine, which is said to be the best, produced 8,274 tons in 1905, the total output in the island for that year being estimated at only about 84,000 tons.

MINING AND METALLURGICAL PATENTS.

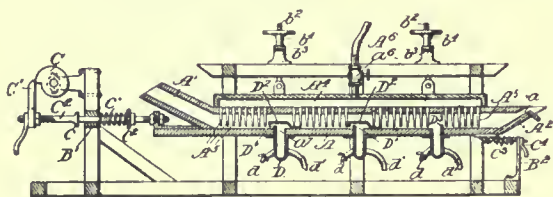
Specially Reported for the MINING AND SCIENTIFIC PRESS.

ORE-SEPARATOR.—No. 853,782; Lon D. Hall and Samuel P. Hall, Prescott, Arizona.



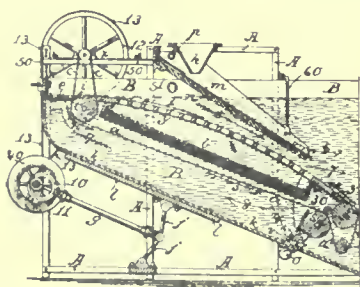
An ore separator comprising a main frame, an endless movable apron mounted in the frame and composed of reticulated material, the relatively lower portion of the apron traveling in a plane below the upper edge of the frame, a receptacle frame supported at one side of the main frame and disposed between the upper and lower portions of the apron, a receptacle supported by said frame and arranged transversely of the path of travel of and between the upper and lower portions of the apron, a discharge pipe leading from the receptacle and supported in one side of the main frame, a second receptacle supported from and lying wholly beneath the main frame, said receptacle extending in the plane parallel to the path of travel of the apron and projecting at the ends beyond the operative plane of the apron, a discharge pipe communicating with the second receptacle, and a spraying device overlying the lower portion.

ORE WASHER OR CONCENTRATOR.—No. 859,354; Enos A. Wall, Salt Lake City, Utah.



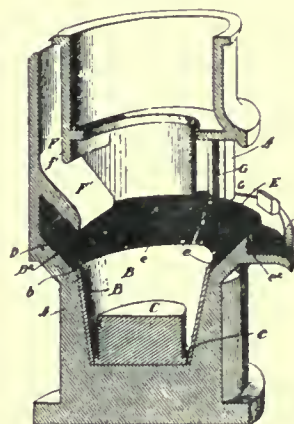
An ore washer or concentrator comprising a horizontally disposed tubular body, having its head end extended upwardly above the top of the body to give the proper head to the water and ore fed therein, and having its opposite or tail end closed and provided with an outlet for the waste material and water at its upper portion above the level of the upper internal surface of the body; whereby the tubular body is maintained completely filled with water, and air contact with the contents avoided, and means for imparting a longitudinal reciprocating movement to the tubular body adapted to cause the concentrate to move toward the tail end of the body.

ORE OR SAND CONCENTRATOR.—No. 861,787; Frederick A. Wiswell, Salt Lake City, Utah, assignor to Wiswell Milling Machinery & Mining Co., Salt Lake City, Utah.



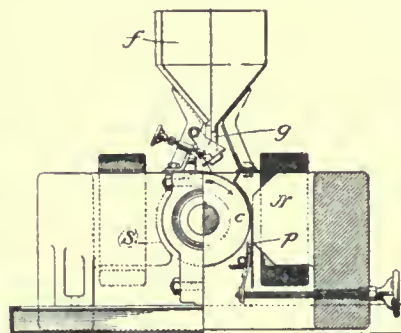
In a device for separating materials, the combination of a tank adapted to contain water, a longitudinally inclined perforated table therein, an endless apron traversing said table, sufficiently wide to cover the perforations thereof, and means for intermittently pulsating water in said tank.

ONE-STAMP MILL MORTAR.—No. 862,298; George H. Nissen, Toronto, Ontario, Canada, assignor, by mesne assignments, to The Nissen Engineering Co., a Corporation of Arizona.



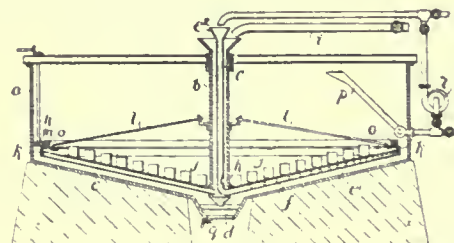
In an ore stamp-mill mortar, the combination of a body having an inlet for ore, an outlet for the pulverized ore, a recess within which the ore is pulverized and an outwardly and upwardly flared portion extending from the upper part of the recess to the level of the discharge opening, an annular amalgamating plate on said flared portion substantially covering the same, protecting plates covering said amalgamating plate and detachably connected thereto, and a die in said recess.

PROCESS OF SEPARATING ORE.—No. 861,782; Henry H. Wait, Chicago, Ill., assignor to International Separator Co., Chicago, Ill., a Corporation of New Jersey.



The herein described process of separating ores having different degrees of porosity from a mixture, which consists in impregnating the mixture with a solution of an iron salt, subjecting the same to an oxidizing agency to form a magnetically permeable oxide upon the more porous material, whereby its particles are rendered susceptible of magnetic attraction, and then passing the mixture through a magnetic separator to remove the particles which are thus artificially rendered susceptible.

SLIMES TREATMENT.—No. 860,775; Charles E. D. Usher, Jeppestown, Johannesburg, Transvaal.



Apparatus for the wet treatment of metalliferous slime, consisting of a vat, means for maintaining the slime therein in a substantially uniform state of suspension, and means for passing a liquid from the bottom of the vat upwardly through the contained slime, means for continuously drawing off clear liquid from above the slime, and means for returning the liquid for further percolation through the slime.

Quarry Work.

During the past fifteen years great progress has been made in quarrying methods, chiefly in installing equipments of machinery to replace the old fashioned and laborious hand-work. Broadly speaking, quarrymen have not readily taken advantage of the benefits to be derived from the use



Chicago Giant Rock-Drill.

of machines designed and adapted to their every-day work. Rather, as a rule, they have been conserved to old methods until driven by competition or the necessity of increasing their production they have been in a sense forced into looking for machine tools to help them out of their dilemma, and even when at that stage, it took many and long hard arguments to induce them to make a trial. But times have changed, so that nowadays it will amply repay anyone sufficiently interested to visit and inspect the power plants at the large quarries in the Ohio sandstone field, the marble quarries of Vermont, or the granite quarries of the East, where one central system is made to supply power for all the machinery used in quarrying and moving the material. Naturally, it was the owners of the large quarries who first made the change; as to the owner of a small quarry the first cost of a machine tool equipment seemed a serious matter, but one after another they keep falling in line, till now, should a prospective investor be in doubt as to the advisability of installing machine tools, it is only necessary for him to visit the nearest similar quarry to his own where they are using machines and let his neighbor tell the story.

After deciding to put in machine-drills, the next question is whether to put in a steam or air plant to operate them. This question is usually answered by a study of the local conditions and whether there will be other machines to

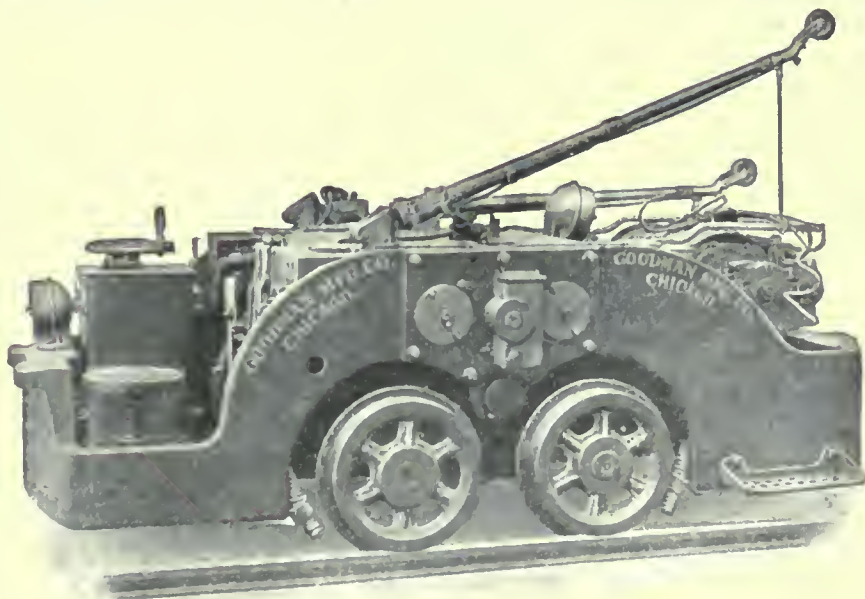
operate, such as hoisters, derricks, and pumps; also whether hand machine-drills are to be used. When the advantages to be gained outweigh the first cost, a central air-power plant is the most desirable installation; but when only one or two machine-drills are to be used and there is no objection to the use of steam, a steam-power drill outfit will be the simplest, also least expensive and providing the proper type of drill is selected the performance will be about equal to that accomplished by the air-power drill.

The accompanying illustration shows a Chicago Giant rock-drill operated by steam, at work on a quarry at Twinsburg, Ohio. This type of drill gives best results when operated by air, but it will also give better satisfaction when operated by steam than any other type of rock-drill on the market. This drill is manufactured by the Chicago Pneumatic Tool Co., 1,010 Fisher Bdg., Chicago.

The Goodman Locomotive.

The two-motor type of mine locomotive does not lend itself well to adaptation for successful gathering service where cars must be handled to and from the face. It cannot ordinarily be built in form sufficiently compact to fulfill properly the requirements of this work. For narrow gauges such a locomotive must have frames outside the wheels, and the over-all length is necessarily excessive because of the construction required for accommodating the two motors. Furthermore, the wheels in a two-motor locomotive must be large, and this prevents running satisfactorily around sharp curves.

Other matters, including length of wheel-base, general over-all dimensions, lack of flexibility in the truck, etc., combine to prevent successful adaptation of a standard two-motor haulage locomotive to the special work of face gathering. For this service, therefore, the Goodman Manufacturing Co., of Chicago, has brought out a line of special gathering locomotives, their design involving all the essentials of compact construction, small wheels, short wheel-base, flexible truck, single-motor drive for the four wheels, and utmost accessibility to all parts. These special single-motor gathering locomotives are built in three sizes, designated as Types 1600, 2600, and 3200. All three include the same general principles of construction, and are particularly designed for quick handling, as of importance in gathering. The illustration shows the Type 2600. The



The Goodman Locomotive.

1600 is lighter and the 3200 is heavier. Type 1600 stands only 32 in. high above the rails, and is only 93 in. long. Types 2600 and 3200 are 35½ in. high and 9 ft. long over the bumpers.

By reason of the short wheel base and small wheels, any one of these locomotives will go wherever a mine-car of

equal dimensions can be run, and, having a flexible truck, will follow a rough or poorly laid track even better than will the mine-car itself. Through gearing of special design and arrangement the armature of the single motor is in positive driving connection with both axles, yet without interfering with the flexibility of wheel-base.

The United States Smelting, Refining & Mining Company.

It will be a matter of very great interest to our readers to know that the United States Smelting, Refining & Mining Co., a Maine corporation, with its executive offices at Boston, has secured such a footing in the field of custom smelting that mine operators in America are no longer dependent upon the Guggenheims or so-called smelter trust. The United States Co. claims to treat a greater tonnage west of the Rockies than the Guggenheims, and within the past year this company has invaded Mexico. The Bingham Junction or West Jordan (Utah) copper and lead smelter of the company, while originally built to handle the product of the company's own mines in the Bingham and Tintic districts, have recently been doubled in capacity, and the plant now ranks as one of the most modern of the large custom smelters of the world. It is situated in the Salt Lake valley, but a dozen miles from Salt Lake City, and is reducing daily an average of 2,500 tons of ore, which comes to it not only from Utah, but from mines and matte furnaces in Colorado, Montana, Idaho, Nevada, and California. The company also owns at Kennett, in Shasta county, California (operating under the title of the Mammoth Copper Co.), six copper blast-furnaces and a new converting plant. It is now building a tramway to these copper mines, but the Kennett smelter is at the same time a custom plant, treating the ores of Tonopah and Goldfield, as well as those of California, Oregon, Washington, and Idaho. At Eureka, Nevada, the Richmond-Eureka Mining Co. is another subsidiary. At this place new hoisting machinery is being installed, and pumps placed for taking out the water that stopped the mines in the early days. At Eureka the old dumps of the several mines contain sufficient ore to justify smelter construction, so that further construction is expected of the company in Nevada. Now and then zinc ores are found that cannot be economically treated in an ordinary smelter, so the company is allied with the American Zinc, Lead & Smelting Co., with mines in the Joplin district, and zinc smelters at Caney and Deering, Kansas, to treat zinc ores, no matter where they originate. These zinc plants have already been found inadequate to the needs of the growing business of this progressive corporation, and material is now being secured to double the present capacity of the plants at both places. In order to be able to treat its own product, as well as to refine the copper and lead of other independent smelters, the United States Co. has recently erected at Grasselli (East Chicago), Indiana, an electrolytic lead refinery with a capacity of 3,000 tons monthly. At Chrome, N. J., it owns and operates (under the title of the United States Metals Refining Co.), an electrolytic copper refinery of 12,000,000 lb. monthly capacity, as well as a copper smelter and converting plant treating the ores of Canada, Nova Scotia, Vermont, the Southern States, as also matte and bullion from Mexico, South America, and Japan. A large dock has been built at Chrome, so that the smelter can receive both by rail and by water.

In Mexico the United States Co. is the holding company for the rich Real del Monte mines and mills at Pachuca and Real del Monte, in the State of Hidalgo. Here the mines have been equipped with electric hoists in 18 well developed mines, and two new mills have been constructed on the property, which consists of 173 claims, and covers 20 miles of territory. A custom smelter is now being planned, and will shortly be erected by the company in Mexico at a point not yet announced; but as ore contracts are being taken, it is safe to assume that the plans have been matured, and that the erection of the smelter will soon be commenced. At Rio Blanco, in the Peruvian Andes,

the company controls the Churruca copper mines and smelters, operating under the name of the Peruvian Mining, Smelting & Refining Co., with head offices at Lima.

The American Exploration Co., with its large staff of mining engineers constantly in the field, and the International Metals Selling Co., which is the selling agency for its products in America and Europe, are two of the subsidiary organizations. The United States Smelting, Refining & Mining Co. occupies an enviable position in the mining world especially, as throughout the inter-mountain district it has been the means of reducing treatment charges, and compelling respect of friend and foe alike. It is an energetic and shrewd organization of experienced mining and metallurgical men, with a financial rating that is of the strongest. Its capital is \$75,000,000, of which \$41,000,000 only is issued, and on which annual dividends are paid at the rate of seven per cent. William G. Sharp and W. H. Coolidge, of Boston, are president and vice-president; Albert F. Holden, an acknowledged leader in the mining and metallurgical field, is the managing director. On the board of directors are many of the richest and most influential men of New England.

Commercial Paragraphs.

T. B. BURNITE, of the engineering and sales department of the John A. Traylor Machinery Co., Denver, has been appointed superintendent.

THE WESTERN ENGINEERING & CONSTRUCTION COMPANY no longer represents the Bucyrus company, that arrangement having expired by limitation. Therefore, the engineering company mentioned is at liberty to construct dredges and placer machinery of every kind.

THE WESTINGHOUSE ELECTRIC & MANUFACTURING CO. of East Pittsburg, has received through G. & O. Braniff & Co., agents for the former company in Mexico, an order for one of the electrical equipments of the Vera Cruz tramways, built by the Vera Cruz Light, Power & Tramway Co. Vera Cruz is the second city in Mexico to be electrified.

THE FOUNDATION COMPANY, of New York, has just been awarded the contract for sinking a mine shaft on the Swanzy range, near Ishpeming, Mich. The size of this shaft will be 21 by 17 ft., and it will be sunk through about 70 ft. of water-bearing material. The Foundation Co. has also been awarded the contract for the foundations of the new 16-story office building to be erected at 160-164 Broadway. This building is for the Lawyers' Title, Insurance & Trust Company.

THE COLORADO IRON WORKS COMPANY reports a large business in smelting equipment during the past few months, the orders coming from all quarters. While the bulk of this business is from the United States and Mexico, other foreign countries have been represented and orders for either furnaces or complete plants are going through the shops for installation in France, Japan, Chile, and New Zealand. The furnace included in the Chilean plant is designed for hot-blast smelting, and the New Zealand order embraces the complete equipment of a hot-blast copper-matting plant with a sampler.

Catalogues Received.

THE PACIFIC TANK CO., of San Francisco and Los Angeles, is sending out Catalogue No. 6, on 'Cyanide Tanks.' It contains 192 pages, and describes tanks and mill supplies.

THE FRED M. PRESCOTT STEAM PUMP CO., of Milwaukee, has published an exceptionally attractive catalogue on 'Prescott Pumping Machinery.' It is profusely illustrated, well printed on excellent paper, and contains much useful information.

Publications Received.

'The Progress of the Mineral Industry of Tasmania,' for the quarter ending March 31, 1907. W. H. Twelvetees, Government Geologist.

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TABLE OF CONTENTS

Editorial:	Page.
Notes.....	221
Indexes.....	222
Zinc Corporation.....	222
Lawlessness and Romance.....	223
General Mining News.....	225
Special Correspondence.....	230
London.....	Toronto, Canada
Mexico City.....	Denver, Colorado
Butte, Montana.....	Leadville, Colorado
	Johannesburg, Transvaal
Concentrates.....	236
Discussion:	
Mining Schools and Their Graduates...One of Them	237
Articles:	
The Caving System at the Darien Mine...A. B. Chase	238
The Uses of Indexes.....Rossiter W. Raymond	239
The Mines of El Doctor.....T. D. Murphy	241
The Stock Market.....	245
Electric Heat v. Heat From Fuel.....	246
Oil in the State of Vera Cruz.....Ezequiel Ochoa	247
Technical Methods of Analysis.....W. A. Seaton	249
New Traction Engine.....	252
Mining and Metallurgical Patents.....	251
Departments:	
Personal.....	224
Obituary.....	224
Market Reports.....	224
Commercial Paragraphs.....	252

Editorial.

CHANGE-ROOMS are both useful and sanitary. The objection to them can only be grounded on the wish to permit the stealing of ore to go un hindered. If a strike follows upon the building of change-rooms at the Mohawk and Combination mines, we hope the managers will not yield to the clamor of those who want to perpetuate sneak thieving at Goldfield. The stealing of ore is bad enough as an abuse of property rights, but it is even worse as a practice that corrupts the mining community and maintains a gang of fictitious assayers, together with other receivers of stolen goods.

GENERAL BOTHA and the legislature of the Transvaal have decided to purchase the Cullinan diamond and present it to King Edward, in token of their appreciation of England's magnanimity. The Cullinan diamond was found in the Premier mine, near Pretoria, on January 26, 1904. It weighs 3,032 carats or 1.7 pounds Troy. The dimensions are 1½ by 2½ by 4 inches, so that it is obvious the stone is of extraordinary dimensions; the largest ever found previously was the Jagersfontein, which weighed only 971 carats. The Cullinan is colorless, perfectly transparent, and the purest of all the big stones. Mineralogists have ascertained, from the appearance of its cleavage planes, that this stone is a part of a much larger one; four pieces have been broken off in the course of geological movement to the place where it was found, and the original form of this piece of crystalline carbon can only be guessed. The gift of it to the English king is a graceful act and the spirit of it expresses a gratitude finer than a gem of many carats.

SPECULATORS IN STOCKS have been uneasy of late and there are signs that the bankers and brokers of New York have had an attack of the nerves. The prosecution of the Standard Oil, the ominous language of the Attorney General, the uncertainty as to which corporation is next to be attacked have frightened the financial groups whose activity keeps the stock market buoyant. "Too much Roosevelt," says one banker. "Corporation baiting," says another. "Attack on railroads," growls a third. All of which may be measurably true. It might be better for the chief law officer of the Government not to joke about "the poor old Standard", it might be more dignified of the President not to berate Mr. Harriman, it might even be safer for the Administration to be on friendly terms with Wall Street, but on the whole we do not accept these as the causes of precipitate liquidation. What we have been seeing of late is a coincidence rather than a consequence. There is acute financial depression at London, there is industrial gloom in continental Europe, there is a collapse in the value of shares at Johannesburg; is that due to Mr. Roosevelt

and Mr. Bonaparte? Hardly. The fact is the market has been through a time of great speculative expansion, the water that was turned into golden wine by the transmuting wand of the promoter turns out to be a feeble liquid, by the natural operation of economic laws the water is being squeezed out of the stock market, and it feels feeble. It is so at Johannesburg, Alexandria, Berlin, London, New York. A local event starts a local manifestation of a worldwide condition. After excessive speculation comes liquidation; after unrestrained prosperity comes depression; after a period of excessively high wages come strikes. It is an old story, told with weary iteration at regular intervals.

Indexes.

THESE may not suggest the most thrilling kind of literature, but they represent one of the most useful forms of book-making. On another page we publish an article by Dr. R. W. Raymond describing the consolidated index to be published by the American Institute of Mining Engineers. With his customary skill he has made a keenly interesting article out of an apparently uninviting subject. Several good suggestions are offered; one of them we venture to emphasize, and that is a conscientious reference to previous contributions on the same subject. While intended to apply primarily to the Transactions of the Institute, it may well be taken to heart by all who write on technical subjects. Even a reference to a contemporary is in good taste in a periodical journal and the recognition of previous writings on the same subject is, to say the least, a scholarly act.

While speaking of indexes, there is one point worthy of note, namely, the choice of a title for a book or an article. Manifestly the shorter the article the longer its title, for as it refers to a small part of a wide field of knowledge the particular scope of it must be indicated. And as it happens that some of the short articles are worth as much as some big books, it is to be regretted that they are found with difficulty in indexes because their titles are not correctly expressive. We have noted this fact in using the Engineering Index published by *The Engineering Magazine*. It is the best general index relating to technical matters, but the usefulness of it has been lessened in many instances by the unintentional perversity of authors who have chosen inappropriate titles. 'Cyanidation in the Transvaal,' for example, is a perfect title because, while brief, it names the process described and the locality where a given method is practised. You can easily find such an article either under 'cyanidation' or under 'Transvaal,' which are the two ideas first associated with the article, the third being the author's name. 'Three Weeks in Mexico' is a badly chosen title because it expresses so little; the only valuable member is 'Mexico,' indicating locality. The 'three weeks' mean nothing. It is impossible to tell what subject is discussed in such an article; obviously, it cannot be the passage of time in Mexico. 'Some Notes on the Occurrence of Copper Ore in Arizona' is another common form of mistaken nomenclature. 'Some' is with-

out value; 'notes' is not much better; the two dominant ideas are 'copper' and 'Arizona'; they ought to be brought out clearly. 'Copper Ore in Arizona' would be an improvement. Another nuisance in indexing is the constant employment of the definite article 'The.' Of course, 'The Geology of Jamaica' may be prettier than 'Geology of Jamaica' but not much, not enough to balance the trouble given to the hardworking individual that prepares a useful guide to current literature and the earnest student digging for data. Much the same may be said of prefixing the indefinite article, as in 'A New Method of Pyrite Smelting'. The article can be spared with advantage. Titles should be as indicative as possible; that is their first function.

Zinc Corporation.

RARELY has the proverbial pluck of British shareholders been better proved than at the recent meeting of the Zinc Corporation, when a frank explanation of ill success was met by a resolution to try again. It will be remembered that this company was organized to buy and to treat dumps of tailing at Broken Hill, it being confidently expected that recent acid flotation processes would permit of the profitable extraction of zinc, silver, and lead in the tailing discharged from the concentrating mills on the Barrier range. The story has had three chapters headed by three processes that have been successively tried and discarded. First the Potter process was adopted and rejected; then the Queneau modification of it, under the inventor's direction; then the Cattermole, which, however, is now giving profitable returns in the hands of the Sulphide Corporation. Not one of these three has proved "a commercial success." Now the Elmore process has been chosen as the most effective variation of the five or six that use an admixture of oil and acid to float the particles of zinc. This is an incident in the big battle of the processes at Broken Hill. Some of the contest between the rival inventions has been fought in the Australian courts; further litigation is under way in London. It is known that a test case will be made as between the patent rights of the Cattermole and Elmore processes; therefore the choice of the latter in the crucial stage of the Zinc Corporation's existence indicates some confidence in the outcome of the litigation between the patentees. At the meeting mentioned, the chairman, Mr. F. A. Govett, spoke of the fundamental similarity between the various processes that they had tried, and stated that the essential variation began after the selection of chemicals, the difference consisting in the mechanism employed to float the particles of mineral and the devices used to trap them after they have been floated. It was announced that in three trials on a working scale, the Elmore process had given 83 to 89 per cent extraction with a 44 to 45 per cent zinc concentrate. Furthermore, the Elmore does not require as fine grinding as the other methods, and it is claimed to work with solutions at the normal temperature instead of requiring heat. In supplementing the chairman's speech, Mr. H. C. Hoover, the responsible engineer,

referred to the Elmore process as apparently "the solution of the difficulty," adding that he could offer no guarantee, for "a responsible engineer never guarantees anything." Which is a true word, said at a trying moment and with rare courage. The Zinc Corporation has available nearly 4,000,000 tons of tailing, so that success in treatment will represent a handsome profit. Even if the new departure ends in disappointment, the episode is worth the price of a heap of tailing, for the pluck of the shareholders, the manliness of the chairman, and the professional integrity of the engineer unite to form an episode pleasant to chronicle in this journal.

Lawlessness and Romance.

IF SOME of the endowments now devoted to universities could be diverted to the maintenance of a few wholesome daily newspapers, the education of the community would be furthered. There are plenty of good technical and professional periodicals, besides the monthly magazines, but the printed matter given to the public every morning and evening is, in San Francisco, for example, so inaccurate and inept, when not purposely misleading and mischievous, that a constant process of civic corruption and mental degradation is at work. More people read newspapers than hear lectures; the student is compelled to correct his lecture notes by reference to books; a large portion of the community reads the newspapers without correction from books; if any books are read, they represent the fiction that amuses, not informs. In short, the average citizen is at the mercy of a press that is a by-word for inaccuracy and the average home is polluted by daily rubbish masquerading as literature. This may not be politic, but it is true. There are a few clean and forceful newspapers, and they can be easily counted. Among them is *The Evening Post*, of New York, which stands for what is safe and sane in journalism. Having a great respect for the *Post*, we have read with regret one or two articles on the new goldfields of Nevada in which the old notion of frontier lawlessness and picturesque disorder is made the keynote to a portrayal of life at Tonopah and Goldfield. In a recent issue there is a highly colored account of the trouble between the labor unions and the mine operators. Such men as George Wingfield, Jack Davis, and Tom Kendall are portrayed as heroic gun-fighters of the type ennobled by Bret Harte; and L. C. Branson, the editor of the *Tonopah Sun*, is pictured as an audacious fire-eater worthy of Marryat's novels. This is all out of focus. We in the West are no longer on the frontier, that frontier has gone with "the path of empire," westward, to the Philippines. Lawlessness is as much lawlessness in California or Nevada as it is in New York or New Jersey, and no efforts of an Eastern *litterateur* can make it anything else. If the Industrial Workers of the World and other leaders of an unintelligent tyranny at Goldfield try to bulldoze a respectable community, it is silly to set up a braggart gun-play in opposition. A community devoted to industrial pursuits such as gold mining ought to look to its police, its Sheriff, and its District Attorney to protect it

and not depend upon a group of gamblers and saloon-keepers, with more than common nerve and an unusual touch on the trigger.

We shall be informed that the constituted authorities were not reliable, or were openly on the side of disorder. The Sheriff was supposed to be controlled by the belligerent labor union and his deputies were members of that organization. This is an old story, unfortunately also true in the Cœur d'Alene and in the San Juan during troublous times, but the permanent cure for such ills is to be found only in returning to first principles; popular government by popular vote chose the men false to their trust and the popular vote must select better men to replace them, as soon as the community realizes the blunder that has been made. Create a healthy public opinion and the rest is easy. In Nevada public opinion was terrorized by both sides. We are informed that Jack Davis has been seen marching about with five pistols attached to his belt; he would go to a restaurant and thump them down, two on each side of his plate, the odd one remaining on his person, much to the edification of small boys and tourists. In a similar spirit of braggadocio the editor of the *Sun* would publish in flaring headlines the invitation to the "dirty scoundrels" to "start something," and he would print in big type across the seven columns of his paper such epithets as "Cowardly Curs" and "Sneaking Dogs." This is sophomoric foolishness. It is no province of decent journalism to invite even the worst ruffians to a gun fight, and it is bad citizenship to foment riot. The story is told of Jack Davis getting an idea that the labor-union people had bought all the guns and ammunition in Goldfield, so he rushed off in an automobile, with a friend in another machine, to Tonopah, and begged the operators there to join him in buying all the ammunition in that town. *The Evening Post* calls it 'Reform in the deserts of Nevada' and while we are not wholly dense to a touch of humor, it is obvious that the incidents related are disgraceful rather than funny. It may afford copy to a light-hearted scribbler, but it is a palpable break-down of popular government and a state of anarchy discreditable to any self-respecting community. Fifty years ago there was some excuse for protecting the community by the guns of saloon-keepers and gamblers; this was before the State was properly organized and before the regular administration of law was practicable; but we have gone far beyond those beginnings of civilization and the cowardly six-shooter, except in necessary self-defense, is as out of date as the vigilance committee and the pony express. Lawlessness is not romance, and "getting the drop on a man" is not heroic. This notion of curing social disorder with more of the same kind, of stopping the brutality of one mob by applauding the brutality of another, is not justice, or law, or civilization. At Boisé, in San Francisco, at Goldfield, we see manifestations of the same tendency to take sides and to make a vendetta out of a situation that ought to resolve itself simply into the assertion of the law, supported by all good citizens, and the administration of an impersonal justice, superior to all partisanship.

Personal.

R. H. CHAPMAN is at Karlsbad.
A. J. McMILLAN is at Rossland.
FRANK H. PROBERT is in Sweden.
THOS. H. LEGGETT is at New York.
E. McCORMICK is at Metcalf, Arizona.
W. MURDOCH WILEY is at Guanajuato.
KARL EILERS is here from New York.
W. C. BRACE, of Denver, is at New York.
W. R. RUST and EDGAR NEWHOUSE are here.
G. F. BEARDSLEY was in San Francisco this week.
A. C. HEWITT has returned to Denver from New York.
W. FISCHER WILKINSON, of London, is on a visit to New York.

A. W. GEIST has returned to Guadalajara from New York.

O. H. FAIRCHILD is examining mines in Gilpin county, Colorado.

THOMAS RICKARD has left London to visit copper mines in Norway.

G. BURROWES is on his way from Vancouver to his home in England.

C. M. FUELLER, of Denver, is doing professional work near Marysville, Utah.

L. W. GETCHELL, of Boston, is examining the Cinco Minas in Jalisco, Mexico.

IVAN E. GOODNER is contracting engineer and surveyor at Rapid City, South Dakota.

H. W. HARDINGE, on his return to New York from the West, has gone again to Cobalt.

EDWARD S. WIARD, of Denver, is doing professional work at Animas Forks, Colorado.

C. P. BOWKER is manager of the Aguila mines in the Hostotipaquillo district of Jalisco.

PHILIP WISEMAN is general manager for the Consolidated Copper Co. at Kelvin, Arizona.

THEODORE GROSS is at Mexico City, as head of the Mexican Mining & Industrial Corporation, of London.

ALBERT BURCH has returned to San Francisco from Mexico. His office is now in the Crocker building, as before the fire.

JESSE SCOBEEY is at the mines of the Virginia & Mexico Mine & Smelter Corporation in the Hostotipaquillo district of Jalisco, Mexico.

LOYAL W. TRUMBULL, professor of mining engineering in the University of Wyoming, has been examining mines in Sierra county, California.

LAMAR H. HUNT, formerly with the Sacramento Gold Mining Co. at Mercur, Utah, is now with the Minerva Gold Mining Co., at Atlanta, Idaho.

Obituary.

G. C. HEWETT died at Colorado Springs on August 12, the immediate cause being gastritis. He was 54 years of age and a consulting engineer of proved reputation, with a clientele among some of the best men in Colorado. He is survived by a widow and three sons, the eldest of whom is Foster Hewett, now on his way from Mexico to Peru.

ALFRED M. ROCK, a young mining engineer in the employment of the American Smelting & Refining Co., was killed by asphyxiation in the Santa Francisca mine, at Asientos, Mexico, on August 7. A fire had broken out in the mine, and Mr. Rock had gone underground as a volunteer to aid superintendent McMahan in placing bulkheads, and in seeing that the miners all got safely to surface. With master mechanic Gould, these men were the last to seek safety, but were all overcome after they had climbed to the first level and had started to crawl out a drainage tunnel toward the surface. A rescue party discovered them in

time to resuscitate Messrs. McMahan and Gould, but Mr. Rock was beyond recovery. After graduation from Harvard, Mr. Rock was for a time an assistant in the U. S. Geological Survey. He soon, however, entered into the employment of the Guggenheim companies, and at the time of his death, at the age of 29 years, was fast rising to prominence in his profession. Absolutely without fear, indefatigable in the performance of his duty, scrupulous in honor, and possessed of an unusually buoyant and cheerful disposition, Mr. Rock was a man who inspired respect and affection in all who knew him.

Latest Market Reports.

LOCAL METAL PRICES—Aug. 22.

Antimony.....	17.00@20.00c	Quicksilver (flask).....	\$38@39.50
Copper.....	24.00@25.00c	Spelter.....	7.00@ 7.75c
Pig Lead.....	5.35@ 6.30c	Tin.....	42.50@44.00c

COMSTOCK SHARES. SAN FRANCISCO.

Closing Prices.		Closing Prices.	
Aug. 21.		Aug. 21.	
Alpha.....	10	Julia.....	07
Andes.....	19	Kentuck.....	10
Belcher.....	21	Mexican.....	59
Best & Belcher.....	85	North Gould & Curry.....	.....
Bullion.....	19	Ocidental.....	25
Caledonia.....	31	Ophir.....	1.02
Challenge Con.....	20	Overman.....	12
Chollar.....	19	Savage.....	91
Confidence.....	82	Scorpion.....	10
Con. Virginia.....	83	Sierra Nevada.....	33
Crown Point.....	26	Silver Hill.....	45
Exchequer.....	37	Standard Con.....	.....
Gould & Curry.....	26	Union Con.....	39
Hale & Norcross.....	78	Yellow Jacket.....	94

CALIFORNIA—Closing Quotations, Aug. 21.

Argonaut.....	.....
Crackerjack.....	21
Extension Mountain Copper.....	1.75
Southern Belle.....	38
Bunker Hill.....	2.50

SOUTHERN NEVADA STOCKS.

San Francisco, Aug. 22.

Atlanta.....	8	53	Laguna.....	1.40
Belmont.....	2.95		Little Tonopah.....	1.50
Columbia Mtn.....	51		Manhattan Con.....	40
Combination Fraction.....	2.15		Midway.....	70
Daisy.....	1.55		Mizpah Extension.....	20
Fairview Eagle.....	1.52		Mohawk.....	19.00
Florence.....	4.65		Montana Tonopah.....	2.95
Gold Bar (Bullfrog).....	59		Nevada Hills.....	5.25
Gold Bar (Goldfield).....			Red Top.....	3.60
Goldfield Con.....	7.25		Sandstorm.....	43
Goldfield of Nevada.....	1.45		Silver Pick.....	56
Gold Kewanas.....	71		St. Ives.....	88
Great Bend.....	66		Tonopah Extension.....	1.25
Jim Butler.....	88		Tonopah of Nevada.....	11.00
Jumbo.....	3.75		Tramp Con.....	33
Jumbo Extension.....	1.80		West End.....	62

(By courtesy of W. C. Ralston, 368 Bush St.)

COPPER SHARES—BOSTON.

Closing prices.

Name of company.	Aug. 22.	Name of company.	Aug. 22.
Adventure.....	2½	Michigan.....	11½
Ahmeek.....	60	Mohawk.....	68½
Allouez.....	35	Nevada Con.....	11
Amalgamated.....	70½	North Butte.....	65½
Arcadian.....	5	Old Dominion.....	39
Atlantic.....	11¼	Osceola.....	108
Balaskala.....	7¾	Parrot.....	15
Bingham Con.....	12	Phoenix.....	1
Boston Con.....	19	Quincy.....	98
Butte Coalition.....	20	Raven.....	1½
Calumet & Arizona.....	155	Rhode Island.....	3½
Calumet & Hecla.....	725	Santa Fe.....	2¼
Centennial.....	21½	Shannon.....	13½
Con. Mercur.....	39	Superior & Pittsburg.....	14½
Copper Range.....	65	Tamarack.....	82
Daly-West.....	13½	Trinity.....	16½
Franklin.....	10¼	United Copper com.....	63
Granby.....	98	Utah Copper.....	41
Greene-Canaan, etc.....	12¾	Victoria.....	5¾
Isle Royal.....	15¼	Winona.....	5¼
Mass.....	4¾	Wolverine.....	144

(By courtesy of E. F. Hutton & Co., 490 California St.)

Owing to the strike of telegraphers, our reports from New York and London are not to hand up to the time of going to press.

NOME.

KETCHIKAN.

ARIZONA.

COCHISE COUNTY.

[illegible]

Map of Seward Peninsula.

GILA COUNTY.

The Old Dominion plant is treating a large tonnage of ore from its own mines and from the Warrior, Arizona Com-

mercial, and Gibson companies. A strike of 16 ft. of good ore is reported this week on the 280-ft. level of the Arizona National, while the Warrior Copper Co. is opening up a good body of ore that runs 9% copper.—Work progresses steadily at the Alsdorf property, under bond to the Lewishans, and which adjoins the Inspiration ground.—At the Old Dominion there seems to be an increase in the percentage of sulphur in the ore from the lower levels, so that it can go direct to the furnaces. Old Dominion ores have always been so low in sulphur that it was difficult to produce matte, high-sulphur ore having often to be shipped in from the Warren district, return shipments of Globe ore supplying a good acid material for the converter linings at Douglas. The Continental can always be relied on for a good tonnage of high-grade sulphide ore, and the Buckeye production continues large. Five furnaces are running at the smelter, the daily production averaging over 100,000 lb. copper.—About 12 tons per day are mined at the Eureka, which was leased by I. N. Kinsey. A small force of men is developing the property, and an orebody running 6% copper has been opened.—Three shifts are engaged in sinking the Great Eastern and Limestone shafts on the Superior & Boston ground, and in driving the west drift and sinking a winze on the Black Oxide.—Some rich samples of copper ore have been brought from the Sierra Ancha district, 50 miles north of Globe, by Joseph Faull and William McFadden. One shaft is down 100 ft. and the other 25 ft.—The Gem shaft of the Globe Consolidated is down 860 ft. and the Boston is 875 ft. deep.

MARICOPA COUNTY.

The Clark-Munger Co. is employing a small force of men and is trying to prove the existence of a body of copper ore. At the 43-ft. level in the shaft a cross-cut has been run and has already shown a little ore, and it is being extended as rapidly as possible to find the entire width of the orebody.—C. F. Smurthwaite, superintendent of the Grand Traverse & Arizona mine on Cave creek, reports that the main shaft of the property, known as shaft No. 1, is down 300 ft. and the workings are in sulphide ore. Hitherto the ore has been oxide.—There is news of a rich strike in Hualapai shaft No. 1, in the northern portion of the county. The strike was made on the 230-ft. level, where a 17-ft. vein of copper ore was encountered.—The Hualapai mines are owned by a corporation composed for the most part of Phoenix business men, and James Dobbins of that city is the manager.

YAVAPAI COUNTY.

(Special Correspondence).—The shaft on the Nigger Brown mine in Black Canyon district is down 175 ft., and in the last 20 ft. it is in a limestone and porphyry contact, in which a pay-streak of sulphide ore is being opened of undetermined thickness, some of which runs high in gold, with a little copper. The shaft is being sunk, and when the 200-ft. level is reached a station will be cut and the contact cross-cut. The mine is equipped with a hoist, and the eight claims comprising the group, situated 12 miles south of Turkey station, on the Bradshaw Mtn. railroad, cover valuable water and timber rights. This mine is among the oldest locations in the district, which was noted as a gold producer as far back as 1865. Caved workings of the miners of those early days are met with in many places, and many stone cabins, with post-holes still standing, recall the pioneer times. The Valenciennes mine, which is reputed to have netted \$40,000 in gold, is situated a short distance south of the Nigger Brown.—Work on the May Mining Co.'s property, in Big Bug district, is to be resumed after a three years' shut-down. The plans of the company are to sink the shaft, now 237 ft. deep, to the 300-ft. level, where cross-cuts will be run to tap two parallel veins that have promising surface showings. The group consists of four claims, and adjoins the properties of the Arizona Exploration Co., known as the Blue Bell mines, on the northeast. The Blue Bell is now producing about 200 tons of ore per day, which is shipped to the Humboldt smelter. The May mine is equipped with a hoisting plant, with a capacity of 600 ft. A good wagon-road connects the camp with Mayer, the nearest railroad station, three miles north.—The business of the Humboldt smelter is rapidly in-

creasing on account of the greater activity in the Bradshaws and other territory tributary to it. The machinery has been ordered for increasing the capacity of the smelter, and the foundations are being laid.

Prescott, Aug. 12.

YAVAPAI COUNTY.

(Special Correspondence).—An excellent strike of copper ore is reported on the Little Daisy claim, belonging to the United Verde Extension Copper Co.'s group.—The new machinery for the Verde Grande is in place, and sinking will be resumed as soon as the shaft can be cleared of water. A No. 7. Knowles sinking pump is used. The main equipment consists of two 50-hp. Erie boilers, a 60-hp. steam hoist made by the Ottumwa Iron Works, one Ingersoll-Rand compressor with a capacity of 374 cu. ft. of air per min., and Ingersoll machine drills. Water for the boilers is pumped by air, from Walnut Springs, a distance of 750 ft., the raise being about 200 ft. The new equipment was sold by Harron, Rickard & McCone, of Los Angeles.—Work on the Arkansas & Arizona shaft is being vigorously pushed, under the direction of its new superintendent, Chas. Lynch. A 5-hp. engine and blower are being installed to keep the shaft clear of bad air.—A great deal of condemnation is openly expressed here regarding the advertising tactics employed by Stanton & Son, of Philadelphia, for the Hall Copper Co., of Jerome, and the management of the Jerome Verde Copper Co. (formerly the Verde Queen), in advertising its property. Both properties are considered valuable by local mining men, but the methods employed to advertise them are considered likely to do an injury to this district.

Jerome, Aug. 18.

CALIFORNIA.

NEVADA COUNTY.

Robert Johnson is developing the ground upon which antimony ore was found some months ago. During the prospecting work, a quartz vein was uncovered, but the ground is so deeply covered with overburden that it is difficult to prospect. A tunnel has been run in 125 ft. on an andesite dike, and will be continued farther.—The Oro Cobre Mining Co. has secured title to several claims near Cisco, in the Red Mtn. district.—On the property of the Sugar Loaf Mining Co., a pipe-line 2,000 ft. long will be laid, to bring water from the Snow Mountain ditch, under a head of 385 ft.—A double-compartment shaft will be sunk and a pumping plant installed.—A rich strike is reported in the Canada Hill Con. mine, formerly known as the Charonnat, at the 1,400-ft. level. The property produced about \$300,000, but the vein was lost on the 1,300-ft. level and the mine was closed down.

COLORADO.

CLEAR CREEK COUNTY.

(Special Correspondence).—Many of the large mines here have been closed down temporarily for want of coal, due to the big washout on the C. & S. R. R. in lower Clear Creek canyon, and now the same thing is happening again on account of the switchmen's strike on the same railroad, the road being unable to handle freight of any kind. Several new companies have been started in this vicinity and they are doing considerable development work. The Hagarstown Mining Co., of which Geo. A. Killam is the local representative, is operating the Darling group near Williams Fork. A contract has been let to open up the main vein, which runs the entire length of the property. The Hagarstown camp is entirely new, although the district has been prospected for years. It is expected that several mills, to treat the ores from the various lodes now being opened, will be erected before the end of the year.—

The Ruby Argentine Co., organized by Rees C. Widler and several Denver capitalists, has commenced operations in the Calla adit, now in about 700 ft. This will intersect the entire group of 13 lode claims: ore that milled \$32 per ton was shipped from the shaft workings years ago.—The Atlantic M. & M. Co. is employing a force of men in developing its property in the Atlantic district. Trenching is going on to prove the veins on the surface. A. A. Ireland, of Georgetown, the manager, believes that he will soon

have a paying property.—The Dewey M. & L. Co., operating in East Argentine, has encountered another lode in its cross-cut. Mr. Ireland reports that the ground is exceedingly hard.—A recent shipment from the Stenwinder on Columbia Mtn. ran 187 oz. silver per ton. There is now exposed in the drift six inches of high-grade sulphide ore, mill tests from which give 250 oz. silver per ton.—The Plebian is being worked through the Claypool tunnel on the same mountain, and some good quartz with scattered ore has been encountered.—The machinery for the Capitol Mining Co. has not yet arrived on account of railroad troubles, but the buildings are up and everything is in readiness for installation on arrival.—The Waukegan property, over Loveland pass, has been the scene of two rich strikes in the last week, six inches of ore that assays 290 oz. silver per ton and in the lower workings 14 in. of solid ore was opened up.

Georgetown, Aug. 10.

SUMMIT COUNTY.

Several shareholders of the O'Reilly Gold Mining Co. have recently been in Breckenridge. H. E. Houghton is president of the company; M. E. Burke, treasurer; Wilbur Treadwell, consulting engineer; and Arthur C. Howard, mine superintendent. The organization was completed six months ago, and since that time 250 ft. of development work has been done.—Shareholders of the Mary Verna and North American companies have been visiting the properties. The Summit company has taken a lease on all the ground above the tunnel level of the Mary Verna, and production will start as soon as the 2,000-ft. tramway is built.—The east drift in the upper workings of the Wellington property is showing some good ore.—Morris, Irwin, and associates are overhauling the West Side mill, and it will run on ore from the Gold Dust mine.—The new tunnel on the Country Bay property is in 125 ft., and will be continued to the 1,100-ft. point.—The Blue Flag mill, near Argentine, is running satisfactorily, and is making a good saving.—The new generating plant for the Arctic mine is being erected, and water-power near the head of the Blue river will supply the machine-drills with electric power.—The Senator tramway and mill are being erected as rapidly as possible, and development continues at the mine.—A contract has been let for 100 ft. of tunnel on the Gold Belle property on Mt. Baldy.

IDAHO.

KOOTENAI COUNTY.

What promises to develop into a good vein of copper ore has been opened at water-level on the Kootenai No. 2 property in the Priest Lake district, north of Spokane. The property lies at the head of upper Priest lake, eight miles west of the Continental mine. The vein exposed in the shallow shaft was 8 ft. wide, and carried 4 ft. of ore that assayed \$50 per ton, with 9.8% copper. Since then the shaft has been deepened a few feet. A new cropping 27 ft. wide was discovered on the property, and traced 900 ft. Andrew Coolin and Edward Moulton control the property.—Steps have been taken by the owners of the mining property near Hayden lake, east of Spokane, to incorporate, designating the property the Hayden Lake Mining Co. Those interested are John Boothe, Isaac and Jasper Cooper, James Baker, and B. King, of Coeur d'Alene. The property is on the mountain, near the lake, and when completed it is expected the ore will be within half a mile of the lake shore, whence it may be hauled on barges and put upon the electric line. The ore is chiefly copper, yielding in some instances as high as 11%. Gold and silver also are found in limited quantities.

NEZ PERCE COUNTY.

W. H. Harc, who has just returned from a trip of inspection to the property of the Idaho Mining Co. of Pierce City, says that much development work is going on throughout the district. On the Wild Rose, which is controlled by the Jellum & Jones Co. of Lewiston, surveyors are running the lines for a tunnel near the new millsite on a water-right recently secured. S. P. Jellum is superintendent of the work.—The American, one of the oldest properties in the

district, is now being operated by J. M. Porter of Spokane, and the showings are the best made in the district for some time. An elevator has been installed, and is now moving an average of 400 yards of dirt daily, which runs as high as 23c. per yard. A. J. Culver has installed a pump on a high bar near the Wild Rose, forcing water 300 ft. above the creek bottom. The Idaho Mining Co. is on a dividend basis and purposes installing elevators near the dredge now at work.

NEVADA.

ESMERALDA COUNTY.

The product of the Goldfield mines for the week ending August 17 is reported disposed of as follows: Shipped to smelters, 470 tons; shipped to Nevada Goldfield Reduction Works, 2,072; to Western Ore Purchasing Co., 708; treated at Combination mill, 560 tons of ore, making a total of 3,810 tons, with an estimated value of about \$400,000. This is the third heaviest production of any week in the history of the camp. The Frances Mohawk lease No. 3 will soon enter the list of regular shippers, and it is thought that the present rate of production for the camp can be maintained for



Part of Nevada.

some time. The Nevada Goldfield Reduction Works receives shipments of ore as follows, during the week: Mohawk Florence, 162 tons; Little Florence, 369; Hayes-Monnette dump, 88; Mohawk mine, 350; Mohawk Combination, 640; Higginson, 112; Red Top, 200; McNaughton lease, 75; Rogers Goldfield Syndicate, 53; Black Butte Consolidated, 18; Frances Mohawk, 5. Total, 2,072 tons. Average estimated value, \$125 per ton. Total mill value, \$259,000. For the same week the Western Ore Purchasing Co. received consignments of ore as follows: Mohawk Ledge, 77 tons; Combination mine, 107; Mohawk Jumbo, 524. Total, 708 tons. Average estimated value, \$125 per ton. Total mill value, \$88,500.

A small shoot of ore was recently struck on the Nevada Pearl property on the Combination southeast of the Little Florence, but it soon pinched out. The operators expect soon to cut a permanent orebody. The Jumbo Annex Company, operating a sub-lease of the Higginson, reports having struck what is supposed to be the Higginson-McNaughton ore-shoot at a depth of 176 ft., although the ore as found is neither rich nor of any great extent. The shaft is down 240 ft. and a cross-cut is being driven toward the vein on that level.—The shaft of the Goldfield Great Bend is down 300 ft. and cross-cutting is proceeding. Work on the 200-ft. level will be resumed at once.—At Black Butte, two shifts are again at work on the Midnight Pawnee. The shaft is down 95 ft. and will be sunk to water-level. Webb Parkison owns the controlling interest.—A heavy flow of water has been struck in the north drift from the west cross-cut in the Combination Extension mine.—A. J. Canavan has been appointed superintendent of the Mo-

hawk mine, succeeding F. J. Healy.—The winze that is being sunk from the 385-ft. level on the Florence L. & M. Co.'s ground is down 40 ft., with ore showing all the way.

NEW MEXICO.

TAOS COUNTY.

Ninety men are on the payroll of the Victoria Chief Copper M. Co., in the Caballos Mtn. One tunnel has been run 650 ft., and some good copper ore has been opened. One carload of ore has been shipped, and a wagon-road to Cutter has been built.—J. T. Heathman has sold an interest in the Bartlett mining property, at the mouth of Columbine river, eight miles below Red River, to Eastern parties.—The Keystone drilling machine for the Barmar Gold Dredging Co. has arrived, and is being hauled to the property on the Rio Grande river.

SIERRA COUNTY.

The final payment has been made on the Ocean Wave group of claims at Hermosa. Development will be pushed and a 10-stamp mill will be erected.

SOUTH DAKOTA.

PENNINGTON COUNTY.

W. W. Trimpj, representing New York men, has just purchased the old Mainstay mill for \$7,000; it originally cost \$100,000. All the back debts of the company will be paid, and work will be resumed.—Some rich sand has been found in the shaft of the Holy Terror mine. The shaft is being unwatered.—At Keystone, the mica property of Charles Upham has been bonded to an Eastern company represented by Joseph P. Labaw. E. N. Ball will have charge of work at the mine.—A rich ore-shoot has been struck on the Jo Dollar property, west of Keystone, in a tunnel that has reached a depth of 100 ft. George Karr has a lease on the property.—It is said that a good vein of ore has been struck on the ground of the Leo Mining Co., on Box Elder creek, near Benchmark, at a depth of 190 feet.

WASHINGTON.

FERRY COUNTY.

(Special Correspondence).—The adit of the Winnipeg mine, in Belcher district, is in 1,070 ft. and is connected with the shaft. E. R. Fraser, president of the company, is at the mine.—The cross-cut from the No. 2 adit of the Copper Key mine has intersected 68 ft. of ore, and is believed to have reached the hanging wall.—The British Columbia Copper Co. will construct an aerial tramway from the Lone Star and Washington mines, to its smelter, at Greenwood, B. C., according to a report from Danville, near where the mine is situated. The ore reserves on this property are increasing with development.—A new body of marketable ore has been encountered in the No. 3 adit of the Lucile Dreyfus mine, near Danville.—An automatic blower and 500 ft. of 4-in. galvanized iron pipe have been installed at the Humboldt mine, near Kellar.—At Meteor camp, the Syndicate M. & M. Co. has 15 claims in a group, with several veins of gold, silver, and lead ore, from 6 in. to 2 ft. in width, and one vein 30 ft. wide. J. W. Bartlett, the manager, says the latter shows fine grained galena, carries some gold, and the average value of the ore is about \$27 per ton. An adit, starting from Stray Dog canyon, to develop the group, is in about 300 ft., is expected to tap the first vein 75 ft. further in, at a depth of about 400 ft., and will have about 1,500 ft. in all to run to tap the widest vein, at a depth of 800 ft.—Drifts are being driven northerly and southerly from the adit, on the vein at the Meteor mine, resulting in a production of one to two tons of ore per day. The selected ore is sacked.—The Longstreet group of three claims covers a vein over 30 ft. wide, which yields antimonial silver and gold ore in quartz gangue. Some of the ore is stibnite. An adit is being driven to cross-cut the vein. The Advance mine is idle, but work on it will soon be resumed.—The Black Thorne Mining Co. (principal place of business Davenport, Lincoln county, Wash.) has three claims. A vein, 30 in. wide at the surface, yields galena, and assays in gold and silver. An adit is in 850 ft., and at about 50 ft. further in should strike the vein at a

depth of 300 ft.—The Keystone group has six claims. A vein three feet wide has produced some gold-silver-lead ore and is being further developed by an adit. George Mathews, of Davenport, is the manager.—The Covada mine, at Covada, embraces three claims in a group. A vein from 6 in. to 2 ft. wide yields gold-silver-lead ore. It has been opened by shafts and adits. The main adit is in 270 ft. on the vein.

Republic, Aug. 19.

OKANOGAN COUNTY.

(Special correspondence).—The Palmer Mountain T. & P. Co., at Loomis, has advanced its adit 300 ft. since resuming work, and it is now in about 4,300 ft. The frame of the mill is nearly completed, and the machinery is beginning to arrive. A new turbine water-wheel has been installed at the electric-plant in place of one that was shattered last spring by a freshet through Toats Coule.—At the Copper World Extension mine a drift has been driven west on the hanging wall of the vein, on the 200-ft. level, for 200 ft., and another is in over 100 ft. toward the east. Where the vein was intersected by a cross-cut from the shaft it is 23 ft. wide, and other cross-cuts from the drifts have proved it to vary from 20 to 30 ft. wide. The ore is pyrrhotite and is reported to assay 5% copper. The company has decided to build a two-mile aerial tramway from the shaft, down the side of Palmer Mtn., to the wagon road alongside Palmer lake, whence the distance to the Vancouver, Victoria & Eastern railway is five miles. It is thought probable that a spur of the railway will be built from the head of the lake to Loomis.—At the Kimberley mine, at Golden camp, power drills are used for driving on the vein on the 100-ft. level. The ore is of good grade, and preparations are being made for regular shipments to the smelters.

Republic, Aug. 19.

BRITISH COLUMBIA.

The coke shortage still prevails; but relief has been promised by the fuel dealers. Le Roi has ceased to ship ore to Northport, but will keep about 150 men at work on development and breaking ore. Some repairing to the timbers in the shaft is necessary, and while this is being done most of the men will be laid off, although shipments to Northport will probably be resumed within 30 days.—During the week ending August 10, the Rossland mines shipped ore as follows: Centre Star, 2,220 tons; Le Roi, 1,155; Le Roi No. 2, 260; White Bear, 260; Nest Egg, 35. Total, 3,910 tons.—At the Centre Star, the prospecting shaft on the Idaho is down 35 ft., and development continues on the War Eagle, Centre Star, and Iron Mask properties. As the smelter is running at reduced capacity, attention is confined especially to development.—The Nest Egg, under lease to Mr. Webb, sent a carload of ore to the smelter this week, which is the first ore sent from a south belt mine in a good while.

The Consolidated company's Trail smelter received during the week consignments of ore in addition to Rossland shipments as follows: Snowshoe, 944 tons; Victoria Nelson, 80; St. Eugene, Moyie, 366; North Star, East Kootenay, 62; La Plata, Kokanee creek, 50; Arlington, Slokan, 34; Payne, Slokan, 30; Arlington, Erie, 24; Queen, Erie, 23; Rambler-Cariboo, Slokan, 23; Standard, 23; Bachelor, 22; California, 22; Vancouver, 21 tons of ore.—Ore shipments to the Northport smelter have ceased, as it will have to close until a coke reserve is had in stock, but 1,155 tons of ore were received from Le Roi during the week.

The Boundary mines made a good record of shipments during the week, in spite of the shortage of coke and cars. The shipments were as follows: To Granby smelter from Granby mines, 15,543 tons; Emma, 300.—To B. C. Copper Co.'s smelter from Brooklyn, 1,184 tons; Idaho, 929; Rawhide, 2,048; Sunset, 1,280; Mountain Rose, 256.—To Trail smelter from Snowshoe, 1,450 tons; from Providence, 30 tons. Total shipments for week, 32,036 tons and for year to date, 711,342 tons.—Boundary smelters treated this week as follows: Granby smelter, 16,583 tons; B. C. Copper Co.'s plant, 11,467; Dominion Copper Co.'s smelter, 5,697. Total treatment for week, 33,747, and for year to date, 697,793 tons of ore.

Reports from Cariboo state that T. B. Hobson, former manager of the Guggenheim interests in that district, has resigned and has been succeeded by Mr. Copeland. The Guggenheims will not abandon their scheme at Bullion, but will probably proceed a little more conservatively with the big ditch on which they have spent so much money.—C. F. Caldwell and G. Gervais have recently returned from the new copper discoveries on Burwash creek in the Kdaunr district, and they report that the country shows some promising prospects.—Several of the shareholders of the Vancouver Island Copper Co. have recently visited the property at Sidney Inlet. A contract has been let to the Riblet Tramway Co. for an aerial tramway with a capacity of 200 tons per day to connect the mine and the ore-bins at the wharf.—E. Lindman, the expert sent out by the Dominion Government to investigate the mineral resources of Vancouver island, has gone to the west coast, and will make a survey of the districts of Seebert and Sareta.—Henry Bahrs has taken a bond on a group of claims three miles from Delmar, in the Similkameen district, near the property of the King Edward Mines Co.—After lying idle for several years because under bond to Pittsburg parties, the Snowytop mine will be worked by a company composed principally of Detroit men, including A. I. Marinette and A. S. Brown.—The Hewitt silver-lead mine at Silvertown

Fuel company is having plans prepared for the bunkers to store 10,000 tons of coal in Spokane.

A late report from Grand Forks says that a tremendous cave-in at the Brooklyn mine in Phoenix camp occurred, the ore bunkers and all below for 300 ft. by 150 ft. wide fell in, taking the tramway track as well as some mining machinery. This cave-in will put the Brooklyn mine out of business for many months. The cause is reported to be that work has been carried on too close to the surface. No one was hurt by the accident, but the damage done will reach many thousands of dollars.

MEXICO.

CHIHUAHUA.

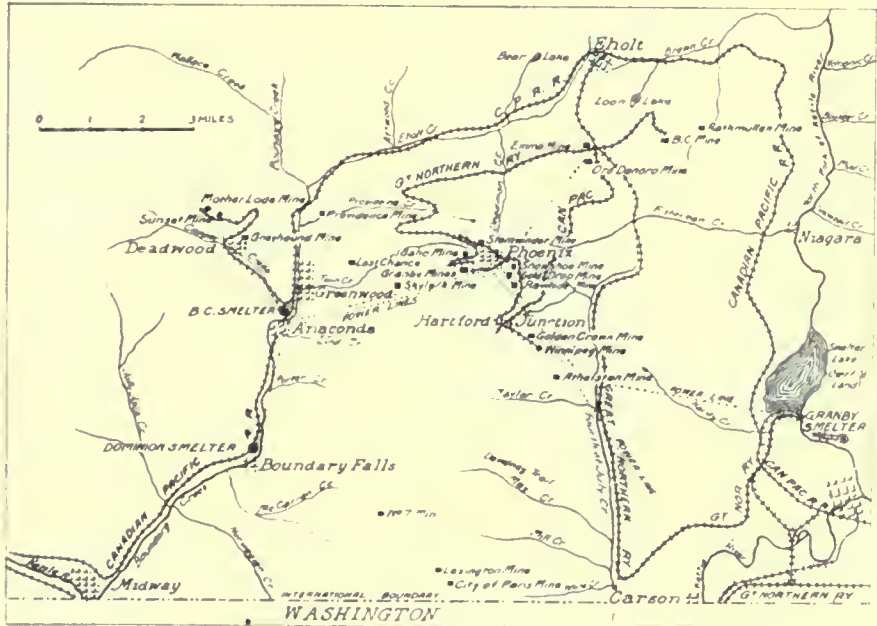
The new Parral Mines Syndicate will start development work on La Union mine, near Vencedora, as soon as the pumps arrive for unwatering the shaft.—The new three-mile aerial tram from the Palmilla mine to the railroad has been started and is handling about 60 tons per day.—Work is progressing well at the properties of the Hinds Consolidated Mining Co. of Santa Barbara. A vein has recently been cut in the Reforma that runs well in lead, copper, and silver.—The shaft of the Santa Eulalia Union M. Co. is down 120 ft. John Lufkin is the superintendent.—At the mine and mill of the Rio Plata Mining Co., near Guazapares, 150 men are employed. Six tunnels are being run and 250 ft. of work has been done in the last 60 days. D. W. Shanks is the manager.—J. M. Sully has made the first payment on the purchase of the Corregidora gold-silver mine, not far from Guazapares.

JALISCO.

Los Angeles capitalists, represented by J. F. Buel, have purchased the mines of the Jalisco Mining Co. in the San Sabastian district. A payment of \$25,000 has been made, and three years time was given for the payment of the remainder. The mines of the Jalisco company have been managed for several years by Alfred Loneragan, and have always been producers. The reduction plant contains stamps, Bryan mills, a Krupp tube-mill, concentrators, and a patio for amalgamation.—The Amparo Mining Co., operating at Emboeada in the Etzatlan district, is employing 1,200 men. The new reduction plant will be in operation in October. Ferdinand Sustersie is the manager. The company has recently filed an application for a concession on the water of the Ameca river, to use in a hydro-electric plant.—Lowering the water in the Casados mines in the Hastolipaquillo district continues, and some rich ore has been struck. J. D. Dotson is the treasurer of the company, and A. H. Mugford is now examining the properties.—The new pump is being installed at the Tenamache mines in Tepic, and the unwatering of the mines will soon start. W. R. Ramsdell is the president of the Tenamache Mining Co., and Amado Aguirre is in charge of the work.—The Mexican Western Development Co., which recently purchased the Santa Eduvigis, Rosario, Valenciana, La Luz, Delicias, and Restauradora mines at Bramador for \$300,000, will build a wagon-road from Bramador to Chamela, a Pacific port. Frederick R. Burnham is the manager.—The Maduro Mining Co. has purchased the Buenavista mine at Jora. This adjoins the famous old San José de Ventanas property. H. M. McIntosh of Chicago is president of the company, and W. H. Lees is manager.

SONORA.

The Lewisohns have purchased the Cananea Nueva mine of Lindsay & Talbot, comprising 1,200 pertenencias north of the Greene-Cananea, on the other side of the granite core.



Part of British Columbia.

has been optioned to New York parties, represented by Oleott Payne. George Stillwell will remain superintendent of the property.—Mining at Lillooet is active. On Alexander and Cayuse creeks hydraulic operations will soon start, and a good vein has been struck in the Lorna mine, which will be extensively developed.—In the Mt. Sicker district, a new orebody has been found in the north vein on the ground of the Tyee Copper Co. The Copper Canyon mines are in good shape, and have been recently acquired by a Philadelphia syndicate, with James Humes as manager.—Work on the Loyal group, Texada island, has been suspended pending negotiations for its purchase. Development work was started a year ago by C. H. Jacobs and associates, and resulted satisfactorily. The mine was once a shipper of copper ore, and is owned by H. W. Treat; it is situated four miles northwest of the Marble Bay mine.—Domestic coal for the Spokane and Inland Empire market will be shipped from Alberta next fall and winter, the latest addition to the list of producers being the Royal Collieries, Ltd., which has acquired the Barnes mine at Lethbridge, Alberta, and 6,000 acres of coal land adjoining, north of Spokane. The principals of the concern are: A. C. Flumerfelt, H. N. Galer, and Andrew Laidlaw. An arrangement has been completed whereby the Alberta Fuel company of Spokane and Calgary, Alberta, will handle the output of the Royal collieries, and with this end in view the Alberta

Special Correspondence.

London.

Cornish Mining.—Dolcoath Shaft.—South Crofty.—Production of Wolfram.—Financial Methods.—Tomboy Returns.—Mexican Mines.—The Deep Leads.—Depreciation in Kaffir Stocks.

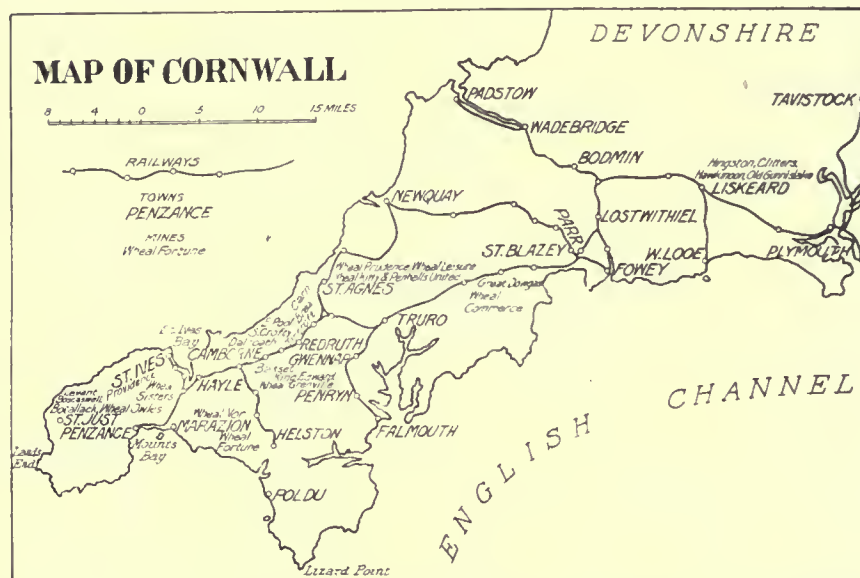
Three sales of black tin took place at Redruth during July, the quantities dealt with being 254, 196, and 241 tons respectively. The average price obtained at the last of these was £110 9s. 6d. or £7 10s. 7d. less than at the 'ticketing' on July 1, but still higher than for the corresponding sale in 1906 by nearly £12 per ton. Cornwall must buck up in the matter of quantity if the current year's sales of black tin are to show an appreciable increase on last year's total—6,227 tons—itself less than for 1905 by 104 tons. The Dolcoath mine—Cornwall's principal tin producer—shows a slight increase for the half-year ended in June, as 51,243 tons were crushed, and the amount realized by the sale of the product was £104,094, against 50,245 tons treated and £101,374 realized for the previous half-year, while in the first six months of 1906 the quantity crushed was 49,931 tons and the sales amounted to £97,268.

According to the *Cornish Post* the proposal to sink the Williams shaft on the Dolcoath property in its present form was described by the manager, Mr. R. Arthur Thomas, to visiting members of the Royal Cornwall Polytechnic Society, as not only politic but economically sound. It might, he said, cost from 3 to 4% more than a rectangular shaft would cost; and not only would a circular shaft make for greater security, but it would allow them to do what was essential to deep mining—it would permit of the conveyance of huge quantities of cold air for the workers 500 fathoms deep. As to the temperature in Dolcoath, the late Capt. Josiah Thomas made some tests which showed that the temperature of the rock 354 fathoms from surface was 83° and the temperature of the air 81°. The bottom of the mine is now over 3,120 ft. from the surface, and Mr. Thomas says the new shaft will be useless unless it is made capable of conveying a good supply of cold air.

The first annual report of South Crofty, Ltd., states that the sales of tin, wolfram, and arsenic for the period from July 18, 1906, to June 30, 1907, amounted to £22,993. The profit was £1,014 and the directors consider it a matter of satisfaction that they have been able to cover all the working expenses during the period of reorganization. Only 32 heads of Cornish stamps have been running. The underground developments are now considered to be far ahead of the 40-stamp Californian mill. The remaining 32 heads of Cornish stamps are being taken out in order to make room for an additional 20 heads of Californian stamps. The ore proves highly complex, but several wolfram sales have already been made at an average price of £150 per ton, and further experiments are leading to a still better separation of the wolfram.

Regarding the developments on the New Cook's Kitchen property under covenant with Mr. Basset, the landlord, a new vertical shaft has been started and it is

now down 140 ft. This has passed through one branch, about 18 in. wide, carrying galena, arsenic, and copper. The shaft will be continued to 195 fathoms. Somewhere between 90 and 120 fm. the manager expects to cut what is known as No. 1 lode. As to the battery, 30 of the 40 Californian stamps are working, and the remaining 10 will start immediately. They are running at 106 drops per minute, with a total drop of 7½ in., using a 25-mesh screen. These stamps are electrically driven; the power taken amounts to about 1s. 2½d. per ton crushed, which should come down to 11d. per ton when the battery is in full swing. The 40 heads are to be supplemented at Easter next year with a further 20 stamps. The 60 stamps, when the rock-crushing plant is in full working, will do a duty of 3½ tons per head and a profit of 20s. per ton is anticipated or, say, £200 per day. The working capital of the Company (£25,000) being exhausted, 4,000 of the reserve shares are to be offered at £4 per share to carry on the mine. This will bring up the total number of shares issued to 44,000. Of these 20,000 were originally handed over to the original proprietors. It now transpires that these Cornish stockholders have parted



with some two-thirds of their holdings to Londoners who have been engaged in writing up the mine until the price of the £1 share has risen to over £6. The future will show whether the men of the East or the West have proved themselves the most far-seeing. Meantime the first dividend is promised for Christmas.

Tomboy returns for July, 1907: Mill ran 29 days and crushed 9,300 tons of ore; estimated realizable value of the product, \$50,000; concentrate shipped, 520 tons; estimated value, \$33,000; total for the month, \$83,000; less working expenses, \$43,000; estimated profit, \$40,000. Expenditure on construction or improvements (not included in above expenses), \$2,290.

The net proceeds of Mexico Mines of El Oro for July are estimated at \$60,000. Dolores' profit for June was \$60,000; the directors of the English company have declared a third (interim) dividend of 3% payable on August 24.

Stockholders and brokers who some nine months ago were described as puzzling over the meaning of cabled reports concerning the extent and value of the 'wash' made accessible on the Loddon Valley Co.'s property must have found the last report issued by the directors much more definite. The report states that the wash has been entered at five or six points. Some of these showed rich wash, but the rich areas proved too local in extent to be valuable as a working mine. At No. 5 raise, however, a run of gold was found which proved at this point

to carry 14 dwt., 16 gr. per fathom for a width of 275 ft. Only a small portion of the company's ground has been explored, and the continuation of this 'run' can only be ascertained by further expenditure. Of the issue of 80,000 shares, 72,827 were subscribed, and as the Company is left with a debit balance at the present time of about £30,000, further money must be raised to meet the liabilities and continue operations. The report adds that the Government of Victoria has offered to lend £8,000 for the purpose of extending the 500-ft. level due north and south. It is necessary, however, under the terms of this offer, that the Company should set apart an equal amount for this special work. The directors find that it will be necessary to ask the shareholders to agree to further funds, to the extent of 5s. per share, being provided by the adoption of the reorganization scheme.

Attention is drawn to the evidence given before the Transvaal Mining Industry Commission of the depreciation that has taken place in the market value of Kaffir mining shares since the year 1902. Taking the dividend-paying mines, the Consolidated Goldfields group, which in 1902 had an issued capital of £4,392,359, of a market valuation of £13,530,553, has, after having added some £231,000 to its issued capital, a valuation of only £10,094,332. The Eckstein group, which increased its issued capital during the period by £95,278, shows a depreciation in market value of £11,217,889 at £16,062,007. The loss on Rand Mines issues amounts to £10,763,750; on the Johannesburg Consolidated Investment group to £4,058,773; on the Neuman companies to £1,524,121; on the J. B. Robinson group to £1,479,187; and on Goerz issues to £1,602,422. On the other hand, the Farrar Anglo-French group, which has increased its issued capital by £1,368,750, and the General Mining & Finance, or Albu, group, which has added £100,000 to its capital, show improvements in market valuation of £706,250 and £137,500, respectively. Including sundry mines, the depreciation amounts to £34,199,551, while in the case of producing but non-dividend-paying mines the depreciation is £11,889,913.

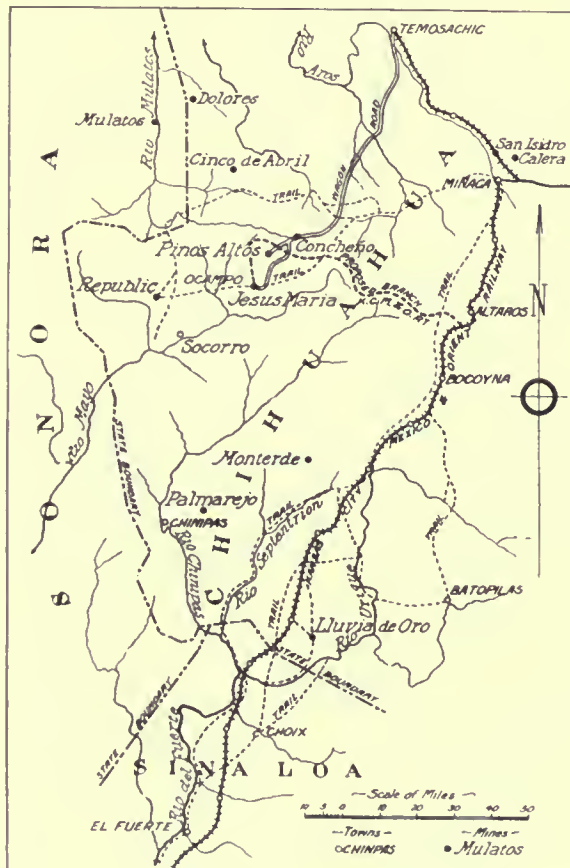
Mexico City.

A Curious Ejectment.—Litigation Likely.—The San Toy Co.—Bad Railroad Service.—Satirical Comment, Fully Warranted.

The mining interests in and about Chihuahua have been greatly excited during the last month by the action of one of the Federal District judges in dispossessing and forcibly ejecting J. P. Hutchinson from the Dolores mine in the Santa Eulalia district, which is held under option from the Escobar estate, whose title to the same was looked upon as one of the oldest and safest in this region. It seems, however, that the new mining law has some proviso that requires an exchange of these old titles for new ones, but which is not understood generally and in the case of the Dolores was not done by the Escobar estate. Learning of this Aguirre Nevarez entered a new denouncement covering part of the Dolores and when his titles were obtained sought and obtained possession through the courts. Mr. Hutchinson has taken the matter to Mexico City, and as it is claimed that both Schwab and Heinze are behind him, it is liable to be a big fight. Should the judge be sustained in his ruling, it will be hard to say whether any of the old mining titles in Mexico are worth more than the paper on which they are written. It is to be hoped that the injustice may be righted and the judge of the 5th Sala in Chihuahua may be looking for another position.

The San Toy Mining Co., which is also in charge of J. P. Hutchinson, has started its direct shipments to the Torreon smelter, using its new aerial tram and switch to

connect with the Mexican Central, at the rate of 50 or 100 tons per day, depending upon its ability to get cars. Almost all the other ore shipments from the Santa Eulalia district, which are contracted to the American Smelting & Refining Co., are practically cut off, with the exception of a couple of hundred tons per month to the Monterey plant, because of the inability or refusal of the Mexican Central to furnish cars, as this Santa Eulalia ore is usually billed to the El Paso smelter, and the yards there now, especially on the Mexican side of the river, are so full of cars that since August 1 the railroad has refused to receive more northbound shipments. This condition is due almost wholly to the fact that the Mexican Central has been so short of motive power that it could



Map of Part of Mexico.

not handle the freight given it, all its yards and side tracks got filled, and then to clean up the northern division engines were rushed up from the south and the long overdue cars sent on so unsystematically and hurriedly that they simply swamped themselves. But the company's inability to handle its freight has not been recent, for on the Chihuahua division alone the conditions have been such that for the last 18 months the Santa Eulalia mines have not been able to produce to more than half their capacity, simply because they could not ship the ores after they were taken out of the mines. And the same condition is said to exist over the entire Mexican Central system. C. R. Hudson, the vice-president, and H. Lawton, the freight traffic manager of the Mexican Central, have just returned to Mexico City in their private cars from an inspection of the main road from Mexico City to El Paso, and there is a rumor to the effect that the road and service was found to be in such a deplorable shape that serious consideration is being given to the advisability of tearing up the tracks and selling them for scrap iron, putting the ties on the market for kindling wood, punk, or peat, utilizing the coaches for way stations, and equipping the road with traction engines in order to insure more rapid

and safe dispatch of both freight and passenger service. And it is understood that some four or five of these traction engines and wagons are now available for the northern division of the old smelting plant of the Encinillas Mines Ltd., at Santa Rosalia, Chihuahua.

Butte, Montana.

The Western Federation and the Local Union.—Butte Montana Co.—Fire in the Minnie Healey.—Strike of Machinists.—The Lewisohns and the Montgomery Claims.

Officials of the Butte miners' union say the vote of the union, at a recent special election, endorsing the Western Federation constitutional amendment making it unlawful for local unions to enter into any contracts with employers relative to wages, hours, etc., for any specified time, applies only to the future and is not retroactive. President Duffy of the union declares that the Butte miners will live up to their contracts made with the mining companies several months ago, when they agreed to accept \$4 per day as long as the price of copper was at or above 18 cents per pound, and to return to the old scale of \$3.50 per day if the price of copper falls below 18 cents and remains there for 30 consecutive days, that agreement to be in force until 1912. When the Western Federation adopted the constitutional amendment it was reported that all existing contracts would be annulled, and that it was specially aimed at the Butte contracts. The assurance of the Butte union officials that the miners will live up to the contract is welcome, as it had been freely predicted that the miners would repudiate the contracts the moment the question was put to them; it was generally feared that they would refuse to go back to the \$3.50 rate and that a shut-down of the mines would result.

The Butte Montana Mining Co. took up the bond on the Alex Scott mine at the last minute, just before the expiration of the option. The company has a large number of stockholders, who purchased stock at prices ranging from 50c. to \$2, and they were fearing that they would have the same sad experience that befell the victims of the Butte Exploration Co. Some Pittsburg people backed the enterprise, but when it came to putting up \$130,000 for the final payment on August 15 they could raise only \$60,000, which sum was wired to Butte. To save the company the Butte men interested raised the balance necessary to take the deed out of escrow. The Alex Scott is a well situated property, near the Leonard mine of the Boston & Montana Co., and a lot of development work has been done on it.

All the gas caused by the fire underground has been driven from the Minnie Healey mine, and work has been resumed in that property by the Butte Coalition Co. It is now believed that the fire started in the old stopes of the Leonard mine, owned by the Boston & Montana Co., and worked its way over into the Minnie Healey. The gas is still strong in the Leonard and the West Colusa mines, which connect with the Minnie Healey. There is a suspicion that the fire may have been of incendiary origin, but the prevailing belief among miners is that it resulted from spontaneous combustion in the old inflammable material used in filling up the old stopes. While the gas was at its worst in the Minnie Healey the ore production of the Coalition Co. was cut off about 400 to 500 tons per day, but the output is again being restored to its maximum, and in another week, it is expected, the output will amount to 1,800 tons of ore per day. The ore from the Minnie Healey comes from the 1,000 and 1,100-ft. levels, and is hoisted through the Leonard shaft. A connection is being made between the 1,100 of the Minnie Healey and the 1,300 of the Rarus, and when

completed some mining will be done through the Rarus. The 1,300 is the next level below the 1,100 of the Minnie Healey, but no mining has yet been done there; an engine is being installed on the 1,100, and will be completed in a few days, when mining will be started on the lower level, where some fine orebodies have been opened.

The strike of the machinists, which has lasted for several weeks, has not yet interfered with mining operations, although every machinist employed by the big companies has gone on strike. There were about 200 employed at the mines, and they did all the repair work on the engines, machine-drills, etc., put in the pipes, and did the work on the new hoisting plants that were in course of installation when the strike was declared. It was expected by the machinists that as soon as an engine became impaired, or the machine-drills required repairing, that mining would have to be suspended, and the companies would be forced to a settlement. However, the miners, who are not in sympathy with the machinists' strike, would not risk throwing 10,000 miners out of work, and when repairs on engines or drills became necessary they made the repairs themselves. Miners have also put in necessary piping in mines, and the only work they have not taken off the hands of machinists is the installation of engines and other surface machinery. That class of work has been stopped. About 10 days' work remained on the new engine and hoisting plant on the Tramway when the machinists went on strike, but as the Coalition Co. will not be ready to make use of that plant for two or three months it is not much concerned about the delay. When the miners got a raise in wages and signed a five-year contract the machinists were offered \$4.75 per day, but they refused to accept less than \$5 per day or to sign a contract. They were informed that if they were not satisfied with what was offered them they could strike, and they did so at the first opportunity.

A vein of ore six feet wide has been cut in the Elm Orlu in a cross-cut at 500 ft. The Elm Orlu is being developed by W. A. Clark. Assays give 2% copper, 100 oz. silver, with some gold and lead. The shaft is nearly 600 ft. deep and is to be sunk 1,500 ft. The shaft is near the west end-line of the Elm Orlu and near the east end-line of the Poser, it being so situated that both claims can be developed through it. The Elm Orlu vein is one that strikes through the Pilot claim of the Pilot-Butte Co., and its development by W. A. Clark has added to the confidence of the Pilot people.

The Raven Mining Co. is making good progress in development. The Raven shaft has reached a depth of nearly 900 ft. and driving on the vein is being done at 700 ft.—The Pittsburg & Montana Co. is mining at a depth of 1,500 ft. through winzes from the 1,200-ft. level, and from 200 to 280 tons of ore is being shipped daily. The two principal veins in the Pittsmont ground are being connected by cross-cuts from the winzes. Shaft No. 1 is down 1,400 ft. and cross-cuts are being run from the bottom of it to the veins.

The failure of the Lewisohns to take up a bond on the Montgomery group of copper claims on the east side of the Butte district has resulted in a suit being brought against them by John McBarron, a promoter, who had the bond on the properties from Henry Brundy and assigned it to Adolph Lewisohn. The McBarron bond was for \$200,000 and Lewisohn agreed to give him \$100,000 for his interest, according to McBarron's claim. He was to be paid in five installments, but only \$4,000 was paid and then a new agreement was drawn up under which the Montana Consolidated Mining Co. was organized by Lewisohn, capitalized for 2,500,000 shares of \$1 each. The company was to take over the Brundy prop-

erties and also take in a lot of other mining interests owned by Lewisohn in the Butte district, including the Granite Mountain and Flatiron claims, which are undergoing development. McBarron says he was to receive \$21,000 cash and 75,000 shares of the stock of the new company, but he has received neither, and the company has abandoned the Brundy bond. The defendants named are Adolph Lewisohn and J. H. Sussman, of New York; J. Parke Channing, the consulting engineer, upon whose report the bond on the Brundy properties was thrown up; H. Clifford Wilmot, mining manager for the new company; Herman Cook and John F. Ryan, president and secretary, respectively, of the Montana Consolidated. An attachment has been levied on the Lewisohn properties in Butte, including the Granite Mountain and Flatiron, and half a dozen other mining claims.

Toronto, Canada.

The Strike.—Some Mines Re-open.—New Discoveries.—Explorations Along the Railway.—Ore Shipments.

The strike at Cobalt is assuming a more acute phase owing to the tactics adopted by the Western Federation of Miners in inducing men (engaged to take the places of strikers) to quit work. Thirty-seven miners, brought under contract from Sydney, Nova Scotia, who arrived at Cobalt on the 9th inst., were surrounded by strikers on their arrival and persuaded to join them. They had signed a contract which embodied an acknowledgment that a strike was in progress, but state that they were informed by the agent engaging them that the trouble was practically over. Others arriving since have also been secured by the strikers. As a counter-move an injunction was secured yesterday by the Buffalo Mines Ltd. restraining Cobalt branch of the W. F. of M. from picketing, boycotting, persuading miners to break contracts, or otherwise interfering with employees.

The King Edward mine, closed since the beginning of the strike, has resumed work, paying union rates, but maintaining the open-shop principle. The Colonial, under the same management, will shortly re-open. At the La Rose seven drills are in operation with double shifts. The Nipissing has 10 machine-men operating drills and a number in training. Over 300 men in all are at work. The O'Brien has 125 men employed, mostly in surface operations.—At the Coniagas 110 men and five drills are in operation.—The Foster, which has conceded the strikers' demands, has 75 men at work and five drills are running. At the 70-ft. level on vein No. 5 rich ore has been struck, indicating an extensive deposit. No. 8, at its junction with No. 5 at the surface, and also at the 70-ft. level, is showing up well. The ore at present blocked out will provide work for 12 months.

On the Cobalt Contact, in Bucke township, an 18-in. vein of silver and argentite has been discovered some 100 ft. from the main shaft. A depth of 10 ft. on this new vein has been reached and ore extracted running from 9,000 to 12,000 oz. per ton. At the Red Rock rich ore is being sacked from No. 1 extension, stated to assay over 10,000 oz. per ton.—A good strike is reported on the Anima-Nipissing property southeast of Latchford.—Development work is being actively carried on at the McKinley-Barragh, where all the plant for the concentrator has now been delivered. Work is being pushed on the Kendall vein where cross-cutting has been done for 100 ft. to an average depth of 15 ft. and a quantity of ore secured showing 12,000 oz. silver per ton. The vein also carries from 5 to 12% niccolite.

Some good finds of ore, showing visible gold and silver, have been made on the Crawford properties in Otto township near Boston station on the Temiskaming

& Northern Ontario Railway. A shaft has been sunk 25 ft. on a vein 3 ft. wide, containing galena, silver, and lead. A black schist formation at the side of the vein contains free gold. A lode of sugar quartz on one claim shows visible gold on the surface. A company capitalized at \$600,000 is being organized to develop the properties.—Willet G. Miller, Provincial Geologist of Ontario, accompanied by Noah Timmins, of Cobalt, has gone to inspect and report upon the new gold area in the Abitibi Lake district.

Shipments of Cobalt ore for the week ending August 10 amounted to 150 tons, from the following mines: Buffalo, 30; Nipissing, 32; Silver Queen, 88 tons of ore.

Denver, Colorado.

The Golden Cycle Mill.—Strike on Colorado Southern.—Coal Shortage.—The Western Federation.—Gold Prince Mines.

The unfortunate fire which almost completely destroyed the mill of the Golden Cycle Mining & Milling Co. at Colorado City on August 7 resulted in a loss to the company of over half a million dollars, about one-half of which is covered by insurance. Excepting the building containing the cyanide vats and the transformer house the entire plant was consumed, as well as a number of freight cars that were standing upon the siding. The fire is supposed to have started from an explosion of unburned gas within one of the Holthoff-Wethey roasting furnaces. The combination of an insufficient water supply and a strong wind from the northwest defied the efforts to subdue the fire and within two hours only the ashes of the plant remained. The plant, the largest and most modern cyanide mill in Colorado, has only been in operation for a few months. The site was originally occupied by the Telluride Reduction Co., which attempted unsuccessfully to put in operation a bromine extraction process. This company was taken over by the General Metals Co. of New York, which a short time later closed the plant permanently. The Golden Cycle Co. last year purchased the site and equipment, and three Holthoff-Wethey furnaces, which were the cause of the fire being the only important part of the original plant included in the new one. Four Edwards furnaces of 100 tons each were added, the sampling and crushing houses enlarged, and a grinding amalgamation and cyanide-house built, the sand being treated by percolation and the slime by agitation and slime-filtration on leaf-filters. Amalgamation proved unsatisfactory and blankets were substituted. The plant was designed and erected under the supervision of Philip Argall. The normal capacity was 800 tons per day and the treatment rates made by the company were so low that a large part of the tonnage of the Cripple Creek district was diverted to it when it began operations. The many mines that have dissolved their contracts with the smelters and other custom mills will either be obliged to close down or renew their contracts on the old terms. The result will probably be considerably to decrease the tonnage of the Cripple Creek district for the remainder of the year, especially of the low-grade ores.

The continuation of the strike of the employees of the Colorado & Southern is causing considerable embarrassment to the mining industry of that part of the State served by the road. Such mines as operate by electric power and are consequently independent of delays in coal supply are unable to get their concentrates moved and are obliged to suspend milling until the congestion is relieved. The smelters are the most handicapped by the shortage of coke, and it is stated that unless the strike is soon broken the Pueblo plant of the Colorado Fuel & Iron Co. will be obliged to blow out their furnaces, at a con-

siderable loss to the company. The efforts of the mediators who have gone to Washington have so far been unsuccessful, although the Commissioner of Labor, C. P. Neill, is engaged in negotiations with the president of the road and the Grand Master of the Brotherhood of Railway Trainmen. Fifteen coal mines in the vicinity of Trinidad have been obliged to close down on account of the shortage of cars. At Central City a dozen of the superintendents and managers of the local industries turned out and operated the trains to prevent a complete tie-up. The city of Denver will also be hampered in its gas supply unless relief is forthcoming soon.

Haywood has returned to Denver and resumed his duties as secretary of the Western Federation of Miners. Moyer has also returned and is at present in retirement. Senator Borah has been in conference with the Colorado authorities, and it is probable that Adams will be extradited to Colorado and there tried for the dastardly murder of A. L. Collins. Pettibone is to be tried at Boise at an early date. The expense of these trials constitutes a serious drain on the finances of the State of Idaho.

The Gold Prince mines near Animas Forks are being examined by the engineers of the Venture Corporation of London, with a view to purchase. If the deal is consummated it will add another to the list of large mines in Colorado owned and operated by English capital. The orebody in the workings of the Gold Prince is extremely large and is said to contain exceptionally rich shoots. The mill on the property has only lately been put in operation, and is unquestionably the largest and most modern stamp-mill in the State. Among the features of its construction are the steel frames and concrete foundations of the 100-stamp batteries and the use of Card tables to treat the fine product, the coarsest being treated on Wilfley tables, and the tailing then reground in tube-mills.

Leadville, Colorado.

The Railroad Strike.—Work on Rock Hill.—Successful Leasing Companies.—Testing With Churn-Drill.—The Old Crown Point.—Prospecting on Breece Hill.

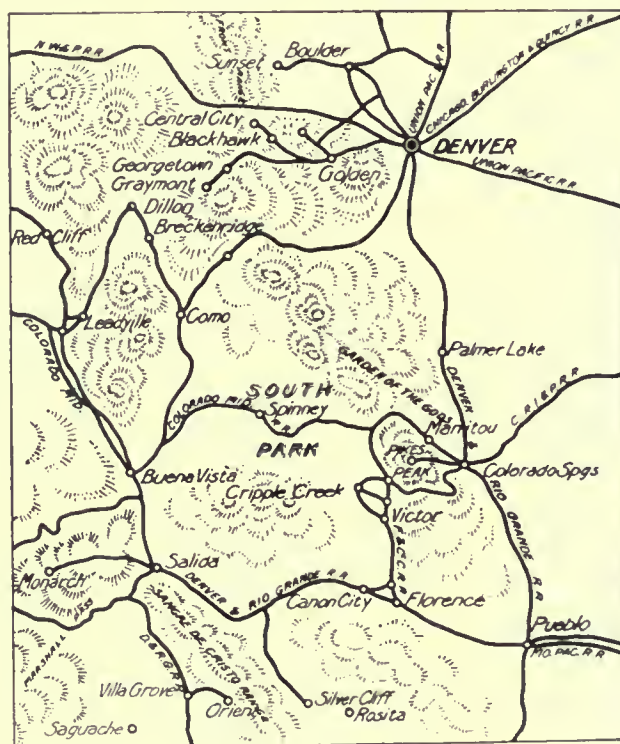
An erroneous report to the effect that the card system will again be introduced in the Leadville district has gained wide circulation. This story is without foundation, is the unanimous reply of the members of the Mine Owners' Association.

The strike among the employees of the Colorado & Southern Railway seriously hampered the shipment of ore from any important mines on Fryer and Carbonate hills, since practically the only outlet for the products of these properties is by the high-line branch of that railway. On the other hand a coal famine was imminent, owing to the same cause. For nearly a year it has at times been impossible to obtain sufficient coal to meet the demands of mining operations, and whenever there is an interruption in the railroad service, it is only a question of a week or so for the stock of coal to become exhausted. The settlement of the strike was therefore most welcome locally.

At the present time Rock hill is most active in substantial exploration and development work. Many new shaft-houses are being erected and plants of greater or less importance installed. Within a year the trend and approximate position of several important ore-channels have been proved. The Rebate Mining Co., operating the Crescentia, is shipping 25 tons of lead sulphide daily and is opening up new ground which promises an increased supply. The shaft of the Ovens Leasing Co. on the Alhambra has reached the contact and driving is well under way to prospect the ore-bearing zone which A. F.

Wuensch, the manager, expects to prove productive.—Howard Collins has returned from the East after completing arrangements with investors to take over the Long & Derry mine. The property was formerly operated by the Anona Mining Co. and substantial gold returns were obtained from near the surface. An adit was started with a view to development of orebodies at a much lower level, but the adit was never completed, and it is the intention of the present company to drive this bore to cut the vein.—Operations on the Hoffer shaft have recently been discontinued on account of the unusual flow of water. Mr. Hoffer will install a larger pumping plant at once, when operations will again be resumed.

The shaft on the O'Donovan Rossa has reached a depth of 540 ft. and passed through a fault zone more or less filled with granite boulders and other extraneous rocks; Mr. Emmons has designated this as the Pendery fault and it is locally known as the Carbonate fault. When the 600-ft. point is reached, a drift will be driven to the



A Part of Colorado.

west across the fault to develop the ore-channel.—It is reported that the lessees of the Hopkins property on Mt. Sheridan have cut a vein of valuable lead-silver ore. This part of the district has been receiving more attention during the present season than at any time previously.

The work of driving the Dinero adit, which was begun early in April, is progressing satisfactorily as a result of the efficient power-plant equipment. The breast has passed the 1,000-ft. point and several veins of minor importance have been cut, but the important lode which prompted the enterprise will not be reached until late in the fall.—A large churn-drill has been in operation since August 5 on the Neusitz placer, in the vicinity of the Capital mine. From the information obtained during the sinking of the shaft on the latter, the wash will be found several hundred feet deep. The operations in the Capital shaft were discontinued owing to excessive water. The Neusitz Placer company will not attempt sinking until the work of prospecting with the drill has tested the ground.

The Crown Point is shipping more than 1,000 tons monthly of iron and lead ores under the lease of Nelson & Casey. They have carried the drift into the old workings

of J. D. Morrissey, where large bodies of low-grade sulphides were formerly developed, and which now can be mined at a profit. Conditions at the Mammoth continue favorable. Three prospect drifts are in ore. Although no shipments of importance have been made, this property will probably enter the list of shippers before the close of the present year.—One of the promising properties of Breece hill is the Sunday mine, which resumed operations nearly a year ago under lease to M. Nicholson. A steady tonnage of silicious ore is now assured.—The Silent Friend on Little Ellen hill has resumed shipments, which are principally lead carbonate containing silver. This property was opened during the early part of the year and lately has been equipped with a modern plant of hoisting machinery.

Johannesburg, Transvaal.

The Strike.—Old Tactics.—Dynamite Outrages.—Gloomy Condition of Affairs.—Gold Production Maintained.

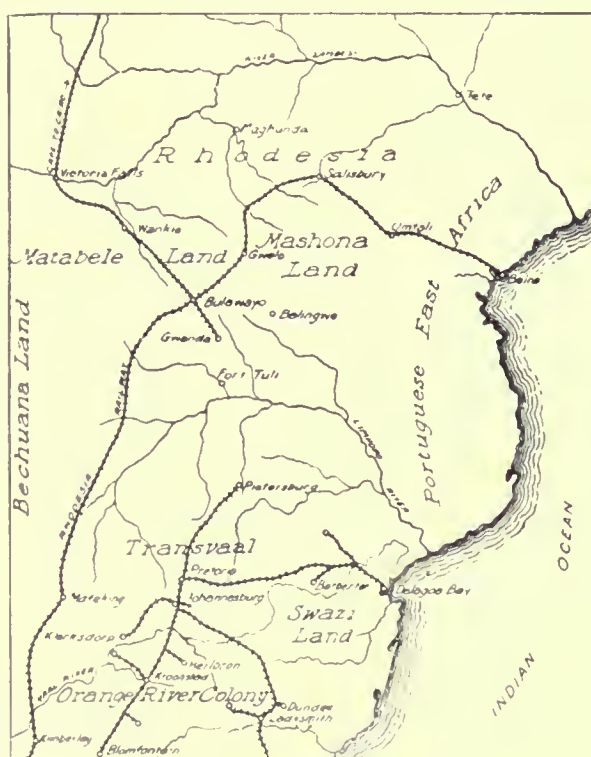
I suppose it is a trait of human nature never to recognize defeat, even though it stare you in the face. At any rate this trait is very noticeable among the strikers on the Rand at the present time. They are hopelessly beaten, and yet they still hold meetings at which their unprincipled leaders tell them that they are on the eve of victory. Such a lot of short-sighted lie-loving leaders never took men more completely into a bog and left them there, than the men who engineered this strike. As usual the Australian agitator is very conspicuous. One of them, Outhwaite, a gentleman who never stays long in any one colony, came to the conclusion some weeks ago that the game was up, so he has gone to England to collect money for the Transvaal strike fund. His place was taken by an Australian equally as bad, one Wilson-Wilson, or 'Windy Wilson' as he is now called. Wilson and the Miners' Union made desperate attempts to get up a general strike along the Rand on July 4. The Government was warned that unless a Compulsory Arbitration Act were passed before that date, every artisan on the Rand would throw down his tools on that date. Botha acted with his usual skill, and pursued the Machiavelian policy of sympathizing with the strikers and at the same time of doubling the soldiers around Johannesburg to prevent them from getting on the war path. Well, the 4th of July, which was to be a 'workman's Day of Independence,' has come and gone, and the efforts of the strikers have failed completely. Scarcely any men that were at work threw down their tools on that day, and the mills ran merrily as if nothing had happened.

Seeing how complete their defeat is, the strikers out of revenge are resorting to dynamite. Already there have been a number of outrages, in which several lives were lost and a number of people were injured. Last week a small hotel, in which a number of 'black legs' were congregated, was dynamited, but strange to say no one was seriously injured. Two nights later, however, a hotel in Bocksburg was blown up, when two men were killed outright and a number injured. The strikers are not confining their attention to hotels. Several pumping stations have been wrecked and one shaft. The mines are now taking every precaution, and more watchmen have been put on to guard the properties. The strikers are also trying to strike terror into the community by writing threatening letters to a number of prominent men of Johannesburg, warning them to leave the city. These letters are treated with the contempt they deserve, the recipients preferring to die, rather than fly from an enemy so contemptible and so cowardly. The little sympathy the strikers once had from the public is withdrawn completely. Even Wilson, the Windy, is held in contempt,

especially as he has deserted the strikers, and gone to another centre to stir up strife. Another leader is leaving this week.

The commercial community is suffering severely from the effects of the strike. This war has accentuated the depression, and many firms are on the brink of ruin. The whole outlook is enough to dumbfound the most blattant optimist. One of the Labor members in the House at Pretoria, gave notice the other day that he intended bringing in a bill for compulsory arbitration for all future disputes. The strikers are indignant that the bill will not be retrospective. It is doubtful that a majority of the members will vote for a Compulsory Arbitration Act, seeing that the scheme has not proved a success in Australia, where the workmen applaud all decisions given in their favor, but consider the act iniquitous when the judges go against them.

In spite of the strike the results for June show up remarkably well, and prove that the effect of the labor troubles is insignificant. The total yield for June was 507,559 oz., valued at £2,155,976, showing a decrease of 16,918 oz., valued at £71,862 over May. There were



Map of the African Goldfields.

8,523 stamps at work in the Transvaal, of which 8,165 were crushing on the Rand and 358 in outside districts. During June 1,912 coolies were repatriated, and 1,882 Kaffirs went home, but the mines are trying to make up for this loss by demanding greater efficiency from the unskilled laborers who remain. The number of stamps at work does not change much, and the whole Transvaal industry seems to be standing still. No one has the courage to undertake the starting up of any new ventures. One mine, the Hercules, which is sinking a seven-compartment shaft, decided to cease work during the month.

Although it is indignantly denied by the strike committee, many of the strikers are returning to work, and are being taken on where there is room. Of course, the strike has dislocated the industry somewhat, especially as regards development work, the policy being to keep the mills at work. The achievement of keeping the mills at work in spite of the strike is a fine one, but it will take some time to get the mines into the position they were in before the outbreak of the strike.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

BASE, or lead bullion, is the term applied to the lead product of the lead smelting of gold and silver ores.

A CORRESPONDENT asks whether he can buy machinery and charge the cost up to assessment work on an unpatented mining claim. Reply is: Certainly not.

POTASSIUM nitrate is a powerful oxidizing agent and basic flux and is used in the assay of sulphide, arsenide, and telluride ores. It melts at about 350° and decomposes at a higher temperature, yielding oxygen, which oxidizes the sulphur and many of the metals. One gram of nitre will oxidize about four grams of lead.

As a general thing, jigs treating coarse stuff require more water than those treating fine material, because larger grains settle faster and because water can pass up in a small number of large interstitial spaces with much less friction than in a large number of small interstices, even though the total sectional area may be the same in both cases, and because large discharge orifices are required above and below.

A BREAKER that mixes two kinds of action in handling its charge will generally be found to be wasting either power or time by so doing. If a breaker crushes the coarser lumps in one part of the jaw by pressure and in another by a grinding action, either the pressure is better than the grinding or the grinding is better than the pressure, and whichever method proves best for that lump would be economical of power in treating all the lumps.

SOME millmen prefer the back knee frame for the stamp battery, because of the solid bracing to the ore-bin. The tappets are in plain sight, the pull of the belt is downward on the cam-shaft, and less lumber is required. If the ore-bin is flat-bottomed, the anchorage and bracing will be strengthened. An objection to this design is the fact that the line-shaft is subjected to dirt and is in an awkward position.

CYANOGEN is composed of carbon and nitrogen, both together forming a composition for which the chemical formula C_2N_2 is used, and which in its action is similar to one single element. The cyanides of sodium and potassium are combinations of these bases with cyanogen, the former acting as carriers for the cyanogen. The action of these compounds in the extraction of gold and silver from ores is based on the fact that they form with these precious metals soluble double compounds.

THE standard unit of the United States and British linear measure is the yard. It was intended to be the same for both nations, but in reality the standard in the United States exceeds that of the British by 0.00087 inch. The actual standard of length in this country is a brass scale 82 inches long, prepared for the Coast Survey and deposited in the U. S. treasury building at Washington. The yard is between the twenty-seventh and sixty-third inches of this scale, at a temperature of 62° Fahrenheit.

IN cleaning up the mortars and mercury traps of stamp-mills working on gold ore, much valuable amalgam is found mixed with quartz, iron, and other foreign matter. These remainders, upon being placed in the clean-up barrel, with additional quicksilver, and cast iron balls, are thoroughly ground and worked, the amalgam being

taken up by the quicksilver and separated from the waste matter. These barrels work intermittently, and are simply small ball-mills consisting of plain iron cylinders revolving on horizontal axes.

IN comparing the work of the Blake and Dodge types of jaw breakers, there seems to be but little doubt that the Dodge gives a higher percentage of fine than the Blake, with the same movement at the throat, especially when run at nearly full capacity or under the condition of choke feed. This may be accounted for by the fact that the Dodge is putting in more work at the mouth than is needed to prepare the lumps for the throat. The frequent choking or stopping of the Dodge is probably due to this excess of fine material, combined with the larger movement at the mouth.

IF, during the process of cupellation in the assay of an ore, the cupel contains the oxide of lead crystallized around the inside, it is said to be 'feathered.' When a cupel is feathered, the temperature has not been high enough to volatilize any of the silver. If the temperature in the muffle during the process of cupellation is too low, or the draft is too strong, the button will 'freeze,' becoming covered with a film of lead oxide that prevents further oxidation. They may be thawed by placing them in a hotter part of the muffle or by placing a piece of charcoal on top of the frozen cupel, but results obtained from thawed buttons are not reliable.

A LARGE variety of zircons is found in the gem gravels of the island of Ceylon, with many other precious stones that are a good deal confounded among native dealers and classified largely by color. The green variety is mostly zircon, with some tourmaline and chrysoberyl. The pale brown also includes some tourmaline. Other varieties of zircon found are rich yellow and fiery red. The readiness with which zircon alters in color by heat is illustrated by the fact that many greenish stones become a fine yellow by heating, and that the pale brown ones are often completely decolorized in the same manner to form the so-called Matara diamonds.

THE uses of chromite are many and varied. The chief use of high-class chromite is in the manufacture of soda and potash chromates and bichromates, which are used as the base for the manufacture of the various other chromium salts. It is also used in the manufacture of ferrochrome for the hardening of iron and steel, and for this purpose it is coming into more extensive use year by year. Besides their use in making chrome compounds, chromates and bichromates are extensively used as pigments in dyeing and printing. Another important process in which chrome is becoming widely used is that of chrome tanning, in which it replaces the tannin of the older bark process.

Two processes have been announced by German experimenters whereby it is claimed that minute crystals of diamonds have been obtained. By one of these it has been able to produce such crystals from pulverized carbon heated in hydrogen on a spiral of iron wire in the electric arc under a pressure of 3,100 atmospheres. The other is a process of fusing graphite with silicates. The experimenter prepares a mixture representing as nearly as possible the composition of the African blue ground, and then introduces powdered graphite. The whole is melted in a crucible, the process being facilitated by using metallic aluminum and magnesium in preference to the oxides of those metals. When the fused mass is dissolved, minute octahedra are found, possessing the physical properties of diamonds.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

Mining Schools and Their Graduates.

The Editor:

Sir—The letter of comment from Mr. George E. Packard emphasizes some points that I touched upon in my communication of May 25. I think his criticism in regard to the State institutions is entirely fair, and it is a matter of common knowledge that the presidents of these schools are often retained because they are good organizers and know how to appeal to legislatures for appropriations, rather than from any acquaintance they may have with the mining business. The table showing the occupations of the graduates of the Lawrence Scientific School is interesting and illustrates the point that I tried to make in my previous communication. We find the men are superintendents, engineers, geologists, metallurgists, or teachers. Where are the foremen, shift-bosses, master mechanics, and construction bosses? I believe the majority of men who have operated mines will agree that a superintendent or manager may know his business, or he may not. None of the actual operating devolves directly upon him, so those below him have no chance to check up his work, and since he is responsible only to the directors, who sometimes know nothing of how a mine or mill should be run, he may get along well enough if he is a good office man and can put that end of the business on a systematic basis. Any man who is honest and has a general knowledge of bookkeeping and general business may qualify for the position of superintendent or manager if he provides himself with good foremen for the mine and mill, and no one need ever know that his operating knowledge is next to nothing, unless there are mining men among the directors, or a consulting engineer is employed. Manifestly this man cannot be as valuable as one who knows the details of the underground business and who is experienced in ore reduction. It might be mentioned right here that as a general thing superintendents and managers have a tendency to spend too little time underground and in the mill. They think that if they run the business end satisfactorily, they can leave the operating end to the foremen and shift-bosses. The inexperienced, of course, do this in self-defense, as they are strangers to the practical side and would not know whether things were being done right or not, even if they saw them. This isolation of the operating and business ends is a bad thing, but is quite unavoidable if the latter is in the hands of a man with little practical experience. An ideal superintendent should have an intimate knowledge of both ends and should be the connecting link between them. It is only under this condition that the maximum results can be accomplished with the greatest economy.

On the other hand, the foreman or shift-boss has got to know his business, because he is in constant and intimate contact with men that do know how. He should, and generally does, know more about how to do the work of each man under him than the man does. He should be able to turn his hand at a moment's notice to any job, and do it so well that it will serve as a useful example to the workman. If he makes a mistake or is lacking in skill or judgment, he is found out by his men, and his usefulness is at an end.

Several men have told me that it has been their experience that when they became superintendents the opportunities for learning the details of underground work

became limited. They could see how the work was going on, in their occasional rounds of the working places, but if they did not know how from previous actual experience, they could not learn by simple inspection, and were unable to appreciate the conditions under which the men were working or to intelligently criticize the results of their labor. Following out this idea, I have known men, who advanced rather too rapidly during the first years of their graduation, to go back to the manual labor end of the business, after several years spent in responsible positions, in order that they might become fortified with the self-assurance that only comes with intimate knowledge of detail. I remember a man who shortly after graduation was made manager of a property in Montana, through the influence of one of his relatives. He stayed with it two years, then resigned, and started in at the bottom, in another camp, giving as his reason the fact that he was unable to learn the details of actual mining while acting as manager. Business details demanded his presence in the office a good share of the time, and when he did get into the mine he could not talk with the men about their work with sufficient accuracy to avoid displaying to them his ignorance, and thereby losing their respect and courting insubordination. Even with his foremen he found it necessary to "look wise and say nothing," and had to be continually on the defensive. These features were especially prominent at the mine in question, as it was in a small isolated camp, where it was necessary that the manager be respected by everyone, if order was to be preserved. If this is a fair statement of conditions as operators find them, then it would seem to be best for mining engineers to spend at least the first three or four years after their graduation in gaining experience by doing manual work in several widely separated camps. Therefore, I say that the condition of affairs as shown by the table of graduates furnished by Mr. Packard may be considered rather deplorable.

Another question that comes up when we see so many superintendents on the list is: What are they superintending? For instance, at many little properties throughout Nevada, you will find a 'superintendent,' having entire charge of a hand-windlass and a crew of three or four men. To 'superintend' a property of this kind means the worst kind of mental and physical stagnation. Mr. Packard accuses me of exaggeration in the instances of reported and actual status. I can only say that the cases cited have come to my actual notice, and I know the details of each of them rather well, so there is no exaggeration. In fact, I might add a great many to the list by quoting other instances that I have seen at various places over a rather widely-scattered field. Perhaps Mr. Packard has not met with any such instances because he has not been 'close enough to the ground.' As to the rest of my stand, of course, I have exaggerated. Everyone who writes or talks on one side of a question exaggerates a little in order to enforce his point. Mr. Packard's statement that the young graduates in engineering have done better during the first four years than the average young doctor or lawyer I consider entirely irrelevant, as these are notoriously professions in which the young man makes his start slowly, depending upon the future for his reward.

ONE OF THEM.

San Francisco, August 17.

THE SHIPMENTS of gold from Bluefields, Nicaragua, to the United States in 1906 were 11,990 oz., valued at \$533,636, against 28,113 oz., worth \$403,866, in 1905.

The Caving System at the Darien Mine.

Written for the MINING AND SCIENTIFIC PRESS
By A. B. CHASE.

The extraction of ore at the least expense is the paramount question at all mines; it was so at the Darien, near Cana, in Panama. This mine proved to be well adapted for the working of the caving system. The idea was first introduced in 1904 by Norris English, a young mining engineer of San Francisco, who at that time was acting manager for the Darien Gold Mining Co., Limited.

The system can be successfully worked on almost any vein, but it is at its best on wide lodes and large ore deposits. Every engineer knows how heavy is the expense of timbering and filling the average mine; if it were possible to abolish this expense and install the caving system, many of our low-grade enterprises could be made to yield dividends.

Under the old company's management the method of working had been based on the use of square sets, which

a round of 5-ft. holes was put into each side of the drift; from the same bar a round of 7-ft. 'uppers' was drilled; from the first round sufficient ore was removed to allow room to rig the bar for the second round, which consisted of 7-ft. uppers only, which broke through into the old workings of the 6th level, permitting waste to cover the ore as in the first case; likewise for the No. 2, 3, 4, 5, and 6 cross-cuts.

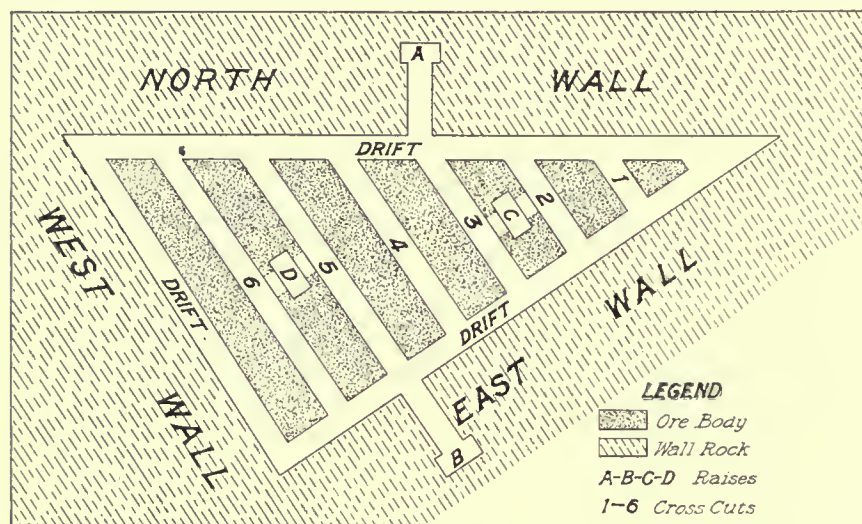
By drilling 5-ft. rounds on each side of the cross-cuts, the pillars were shot out, thus leaving the entire first floor a mass of broken material. In order to rig up and drill it was necessary to take out a certain amount of lode, in the operation of getting the ore into the chutes it was a greater convenience to use wheelbarrows than cars. While the work on this floor was being carried on, development was also in progress on the second floor, which was 14 ft. below. This distance was such that two 7-ft. rounds of uppers would break through into the old workings. The stoping on the second floor was the same as on the first floor. When breaking from the second to the first floor all the ore was taken until the waste started. The result of this method was that absolutely no ore was lost, and scarcely 5% of waste was milled. The filling was done from surface, as the lode had been extracted from the surface down to the 6th level. When the ore was extracted, the waste would settle, and it was necessary to keep the pit on the surface filled. The cost did not exceed ten cents per cubic yard; under the old system of filling, that is, of driving cross-cuts into the wall, the cost was nearly \$1.50 per cubic yard.

The positive gain as compared to filling is evident; furthermore, the method is a far greater security against accidents, as there is solid ground overhead, underneath, and on each side, with absolutely no expense for timbering.

There would in all probability be many variations in the system when used in other mines, owing to the character of the lode and the walls. Any suggestions or information will be gladly furnished by the writer, who was mine captain at the Darien during the working of this system.

GOLD PRODUCTION OF AUSTRALASIA.—The amount of gold mined in Australia and New Zealand for the first three months of 1907 was approximately 918,735 fine ounces, against 996,644 fine ounces for the corresponding period of last year, the value being about \$19,001,735, against \$20,613,034. The decrease in quantity is 77,909 oz., and in value about \$1,611,299. This decrease is a general one, Victoria being smaller by 28,830 oz., New South Wales by 4,855 oz., Queensland by 5,787 oz., Western Australia by 27,209 oz., and New Zealand by 21,880 ounces.

KLONDIKE DREDGING.—It is reported that the principal gold dredging company operating in the Yukon Territory will put three new dredges to work this summer on Bonanza creek. They cost \$225,000 each, erected ready for operation, and will be run by electrical power brought from a power-house 33 miles distant, and each machine is capable of handling 3,000 cu. yd. of earth per 21 hours. Another company is operating a dredge on the Klondike river with a capacity of 4,000 cu. yd. per day.



Plan of Darien Mine.

proved a great expense, and was wholly inefficient. The ore near the surface milled 2.35 oz. per ton. Any stuff milling less than one ounce was used as filling or left undisturbed. Below the 5th level the ore was of a decidedly lower grade, and it became absolutely necessary to adopt some means of extracting it at less expense.

The caving system was successfully applied in the following manner: The form of the orebody at the 6th level was a scalene triangle, having dimensions of 150 by 120 by 80 ft. From the 7th to the 6th level there were two raises in the country rock, one on the north wall and one on the south wall, keeping an average distance of about 15 ft. from the lode. There were also two raises in the ore. Fourteen feet below the 6th level drifts were run from the raises to the orebody. After encountering the ore, drifts were made along the east and south walls. Every 10 ft. cross-cuts were run through the lode to the north wall, these cross-cuts averaging 5 by 7 ft. On the north wall, 14 ft. below the 6th level, a drift was run the full length of the orebody. The cross-cuts from the east and south wall extended through to this drift, thus leaving the orebody entirely surrounded by drifts. Stoping was begun by cutting the mineral loose from the north wall through to the old workings on the 6th level. The ore from the first round of holes was removed; with the second round the old workings would be broken into, and the ore would be covered with waste. In cross-cut No. 1, near the north wall, a machine was rigged up and

The Uses of Indexes.

By ROSSITER W. RAYMOND.

[The following preface to the forthcoming complete analytical and alphabetical index of Vol. I to XXXV, inclusive, of the Transactions of the American Institute of Mining Engineers, here published in advance through the courtesy of the Secretary, will be interesting and suggestive to non-members, as well as to members, of that society.—Editor.]

The great additional value given to professional books by adequate alphabetical and analytical indexes has been recognized from the beginning in the publications of the Transactions of the American Institute of Mining Engineers. The first ten volumes, edited by Dr. Thomas M. Drown, as secretary, were provided with indexes, as well as tables of contents. Moreover, he included in Vol. V (published in 1877), a consolidated index of Vol. I to V, inclusive; and, at the time of his resignation in 1884, he had prepared a similar index of Vol. I to X, inclusive, which was published in the following year.

The indexes of the annual volumes from Vol. XI on were made much more extensive than their predecessors. Casual mentions, as well as important discussions, were included; the geographical localities of mines or works alluded to in the text were added in the index; and numerous cross-references were introduced, with the purpose of making it easy for the student to discover at once what the Transactions contained, either of thorough treatment or of hints and clues to further inquiry, concerning any topic, locality, or person within their scope. In order to extend the advantages of this larger scheme to the earlier volumes, a consolidated index of Vol. I to XV, inclusive (published in 1888), was prepared by compiling the several annual indexes, and introducing additional items for those preceding Vol. XI. Vol. XX, issued in 1892, contained a similar consolidated index for Vol. XVI to XX, inclusive; and in 1897, a separate index volume, covering Vol. XXI to XXV, inclusive, was published. These four indexes, for Vol. I to XV, XVI to XX, XXI to XXV, and XXVI to XXX, respectively, bound together into a book of about 950 octavo pages, have constituted for the last ten years a consolidated index to the Transactions which they cover—with the single difference that the book had to be consulted four times when a single comprehensive index would require to be consulted but once. This disadvantage, however, was relatively small, compared with the great convenience of finding by four trials in one book what would otherwise call for 30 separate searches in 30 books. Moreover, the possession of the one might be most useful to a student who did not possess the 30, by indicating to him what they contained, and thus enabling him to make further inquiry without fruitless labor. To this feature of value in such indexes, I shall presently recur.

The usefulness of the compound four-fold index referred to, is proved by the fact that the supply of copies has been exhausted. In view of this foreseen event, it was decided to issue, instead of the customary additional five-year index, a complete consolidated index of Vol. I to XXXV inclusive, which should take the place of all preceding ones; and Miss L. E. Howard, the accomplished and indefatigable librarian of the Institute, has been for more than two years engaged, with competent assistance, upon this laborious task. The result, embodying a compilation of the former index volumes and the annual indexes of Vol. XXXI to XXXV inclusive, with numerous corrections, improvements in classification, additional cross-references, etc., is the present book,

concerning which I desire to offer the following comments:

1. That this index is absolutely free from error, it would be ridiculous to assert. The atmosphere of an office and library crowded with daily visitors and overwhelmed with daily routine work does not permit such careful, intense, and minute revision as technical perfection requires. While many errors contained in our former indexes have been detected and corrected in this one, some have doubtless been brought forward into it. In this respect, I beg (though I hope it is unnecessary) to say, that with regard to this, as to every other, publication of the Institute, our rule and practice is, to be grateful, not annoyed, when we receive notice of an error, and to acknowledge and correct, not hide or ignore it. Notice of any errors discovered in this book is therefore earnestly requested.

2. It would be likewise unwarrantable to claim for the present index a complete and consistent logical arrangement. Indeed, I am disposed rather to assert for it a higher merit—namely, that of a method more elastic than any fixed system. The controlling purpose has been to make sure that the reader, seeking either the name of a mine or process, or the forgotten title of a paper or its author, or, on the other hand, desiring to be put upon the track of an inquiry concerning something which may or may not be mentioned in the Transactions, and wishing to be positively assured as to that point, before looking elsewhere, shall be satisfied as quickly as possible. Hence, in the construction of our index, we put ourselves in the reader's place, and often introduce a cross-reference not logically required by the text, because it may help him, if he has forgotten the term actually employed in the Transactions. In short, we make the index, not a mere concordance of words, but also a dictionary of topics and ideas. And, as to any proposed cross-reference, our rule is, "When in doubt, put it in!" For it cannot harm anybody, and it may help somebody.

The result of this system, if system it can be fairly called, has been, I know, that many members of the Institute have formed the habit of going first of all to the Index of our Transactions, sure of learning at once and without troublesome search, whether and to what extent, these volumes can aid them in any investigation they are called to make. I need not emphasize the folly of publishing, in these days, books on technical subjects without alphabetical indexes—a sin for which the most elaborate table of contents does not atone, and which, having repeatedly brought its own punishment, has well nigh gone out of fashion, as unprofitable sins are wont to do. But I may be permitted to express my surprise that so many editors and publishers of books intended for permanent reference, having taken the trouble to make indexes, do not take the small further trouble of making them adequately, abundantly—even unnecessarily and ostentatiously—full. There is no better recommendation of such a book to the potential purchaser, because there is no equal guaranty of its continued value to the actual purchaser. Practical men look to books for aid in the form of energy given or saved to them. Now me^2 is the formula for energy; and in this case m is the information wanted, and v is the speed with which it can be obtained. In other words, m represents the value of the text of a book, and v the effective aid furnished by the index; so that the permanent usefulness of the book is represented by the text, multiplied by the square of the index! (mathematics, but it is unquestionable). This may be questionable experience, as the practice of nearly half a century qualifies me to declare.

3. Comparatively few of the members of this Institute

possess complete sets of its Transactions. The number of such complete sets now on hand is very small—perhaps 25. The volumes have never been stereotyped, and it is not likely that any of them will be reprinted. The Institute maintains at more than a hundred important mining centres throughout the world, free sets of its Transactions, open for consultation without fee, by all suitable applicants. This list cannot well be increased. If this new consolidated index of 35 volumes would be useful only to those who possess, or may hereafter possess, all of those volumes, the large cost of its preparation and publication would involve a most unwarranted and foolish outlay. I wish, therefore, to urge upon all students and practitioners, whether members of the Institute or not, the following considerations concerning the special value of this Index to those who have not the volumes themselves.

Indeed, in a certain sense, such an Index is more useful to the non-possessor than to the possessor of the books. For the latter can, at the cost of some extra labor, find out what each volume contains, whereas the former, having at hand neither books nor index, is utterly ignorant whether the Transactions could help him or not. I often receive letters from members thus situated, inquiring what our Transactions contain on this or that subject; and while I do my best to satisfy them, I cannot be sure that my hasty search is complete and conclusive; and I am obliged, whenever practicable, to refer them to some library containing the volumes, and bid them do their own hunting. But, on the contrary, if a member, finding in the Index the title of a paper, or the record of any remarks, concerning a subject in which he is interested, writes to the Secretary concerning it, I can easily, and always do gladly, tell him in reply what is the nature, length, etc., of the said passage; whether we can furnish it to him in separate pamphlet form, etc.—these being particulars which my clerks can ascertain for me at once. Moreover, members of the Institute send me, not infrequently, valuable professional papers, in which previous contributions to the Transactions, directly or indirectly dealing with the same subjects, are ignored. It is my theory that the author of an Institute paper should recognize what his fellow-members have done before him in the same line. Of course, if he fails to do this, it is because he does not possess the back-volumes of our Transactions, and is not acquainted with their contents. It is the duty of the Secretary to call his attention to this omission; and the result is not only extra labor for the Secretary, but often also some unnecessary mortification to the author, who is obliged to recast his paper in the light of the new information furnished to him. All this would be avoided, if the author had at hand simply an Index of the Transactions, upon the consultation of which he could have obtained from the Secretary, in advance, both guidance and aid.

4. But there is another and more important reason for recommending to all mining engineers, metallurgists, etc., whether members of the Institute or not, the acquisition of this volume. Namely, the issue of it by the Institute is part of a plan, the full realization of which is scarcely yet in sight, while every step towards its complete accomplishment is, in my judgment, to be regarded as an assential gain.

As is well-known, the generosity of Mr. Andrew Carnegie, for many years a member, and now an honorary member, of this Institute, has provided for this Institute, together with the American Society of Mechanical Engineers and the American Institute of Electrical Engineers, the magnificent building in which our headquarters are now permanently located. One consequence of this arrangement is that the libraries of the three societies are

accommodated together in the 12th and 13th stories of the building. These libraries, aggregating more than 50,000 books, pamphlets, etc., comprise perhaps the most complete record of modern engineering practice in the departments of the three societies which can be found in the United States—for specifically American practice, perhaps the best in the world. At the present time, they are separately owned and administered by the three societies; but, so far as their use is concerned they constitute practically one library, to which the members of each society and others properly introduced, have free access. We hope, by means of indexes and catalogues, to extend this advantage to members at a distance, who may thus be enabled to consult books and periodicals by correspondence, to obtain copies of text and drawings, etc. Towards this end, the issue of the present Index is an important step.

A WOOD PRESERVATIVE.—Recent experiments in Belgium have been made with a new coal-tar extract, known as injectol, which have given satisfactory results. The experiments were principally devoted to the treatment of wooden poles and blocks used in street paving. The product is a liquid of a dark-brown color, thin, and of regular density. Its degree of viscosity changes but little with atmospheric variations. One of the principal advantages is its penetration into certain woods without any pressure. For the antiseptic treatment of compact woods, using the apparatus similar to the Breant system, the time necessary for the pressure and soaking into of a given quantify of injectol is considerably less than for any other antiseptic liquid, including creosote. As regards its antiseptic qualities, the following experiments and results obtained therefrom speak for themselves. It has been found that where creosoted poles in the ground have only resisted decay for a few months, those treated with injectol remained unattacked after three years. Similar experiments were also made with railway sleepers; the latter were treated with different antiseptics. Some were soaked in a mixture of coal creosote, creosote and chloride of zinc, and two were treated with injectol. After having been left for a period of two years in a steeping vat composed of liquid manure and other miscellaneous decomposing substances, it was found that the two treated with injectol were still in good condition while the others were almost completely destroyed. Similar results were obtained with wooden blocks for street paving. Other experiments are now being carried on and the results obtained will soon be made public.

AN interesting discovery of variscite, an attractive and wholly American gem stone, hitherto obtained from only one locality—at Mercur, Tooele county, Utah—was made in Utah. The situation is about 20 miles northwest of the old one, 9 miles west of Stockton, and some 40 miles southwest of Salt Lake City. The mineral appears in a vein that crosses a little spur or foothill running eastwardly from the main range of the Stansbury Mtn. The variscite occurs in two seams or veins which traverse this foothill in a northerly and southerly course, dipping steeply westward. The surface rock appears to be an iron-stained brecciated quartz. At the west end of the hill, where a little depression separates it from the main Stansbury range, there is an outcrop of brownish laminated quartzite; at the east end appears a strong body of bluish limestone. No metallic veins have been observed in the vicinity. The variscite itself occurs in the same manner here as at the Mercur locality, in roundish or kidney-shaped nodular masses, from the size of a lemon to that of a large cocoanut, with a rough external coating or casing of reddish-brown color, inclosing the beautiful green material within.

The Mines of El Doctor.

Written for the MINING AND SCIENTIFIC PRESS
By T. D. MURPHY.

These mines are in the northeastern part of Querétaro, about seven kilometres from the Montezuma river, which forms the boundary line between the States of Querétaro and Hidalgo. The nearest railway point is Bernal, on the main line of the Mexican National Railway, 80 km. from the mines. This station is 204 km. or 5½ hours by rail north of Mexico City; it is becoming an important



Laguna Reduction Works.

shipping and distributing point for the lead and antimony mines of the district.

Little has been written of the history or geology of this district. When the Spaniards spread over the country in their eager search for mines, they invaded the remote mountains of Querétaro as well as the more accessible parts. They discovered and worked the El Doctor mine and many others in the vicinity. Coming in by way of Zimapan, one of the oldest mining towns in Mexico, they discovered mines at Maconí, El Doctor, and San Cristóbal, and then spread northward to the important districts of Guanajuato, Zacatecas, and San Luis Potosí. The ores were transported to places where water was available, as is testified by the ruins of many old smelters and water-blowing towers, now crumbling to decay, but grass-grown slag dumps are found in the hills all over the country remote from the rivers, where smelting was carried on in stone and adobe furnaces, the blast being furnished by hand-blowing. They did close work too in those days, for the dumps are low in silver. To obtain air for the furnaces, water was conveyed in an aqueduct and dropped some distance through a stone shaft (*chiflón*). The entrained air, and that drawn through openings in the sides of the shaft, was compressed by the descent. A separation was effected at the bottom of the shaft, the air going through a main to the furnace and the water running back to the river. There is a record of the operations of some of these old smelters as far back as the year 1700. Previous to 1780, however, not much

is known of the history of the mines, but an account has been kept since then. During the revolutionary periods work languished, but between 1821 and 1878 operations were carried on with energy. No accurate data in regard to the production of the district from the time of discovery to the present date are available, but the total production is said to be \$40,000,000 in silver.

After the Spaniards left the country the mines came into the hands of Ignacio Trigueros, a Mexican, who did considerable work, but operations were soon suspended by him on account of the difficulties of extraction and unwatering, as everything had to be carried out on the backs of *peones*. After lying idle for several years, in 1884 Gustavo Beaurang, then consul-general of Belgium in Mexico, came into possession of the mines. He unwatered the workings, did some development, installed machinery and a water-jacketed smelter, and inaugurated a new era of mining and smelting; he was succeeded by his son, Victor. Young Beaurang had received a good technical training at a college in Belgium and had spent some time in practical work at various mines and smelters in Europe, and on arrival at El Doctor in 1886 he was well equipped to direct operations in the mining and metallurgy of lead-silver ores. Being shrewd and strenuous, he proved an economical manager, and many of the improvements he introduced at the mines have left

marks of his ingenuity. The business earned profits for a number of years, but hardly any of the money taken out was put back in underground development or betterment of the mines, being invested in other enter-



Loading Mules With Bullion for Germany.

prises in Mexico, consequently the properties were never opened up as they should have been.

When Beaurang entered the district he 'denounced' a large area of country surrounding the then producing mines in order to discourage possible rivals from coming in. This scheme worked well for a time, but the payment of taxes became a burden and he soon permitted many of the chief denouncements to lapse, thinking, perhaps, that the fact would not be discovered. He was eager to make money, but he disliked to spend a dollar if it could be avoided. Labor was cheap in those days,

because the Indians had never been disturbed by offers of higher wages to go to other mining camps. The important work about the mines, such as engineering and metallurgy, was done for little or nothing by young men from the colleges in Belgium and France for the sake of the experience gained. Many a thesis was written upon the subject of geological formations in the El Doctor district, with special reference to the Cretaceous fossils found there, while the young fellows were surveying in the mines or working a shift at the smelter; for Victor Beaurang never permitted his college chums to remain idle.

In 1900 Thomas Braniff Jr., of Mexico City, who was on a tour of inspection of the mining districts of Hidalgo and Querétaro, with an eye to investment, rode across the range from Zimapan to Maconí. After a personal examination of the old workings, and the mines in operation at that time, he became impressed with the future possibilities of the district and made up his mind to invest. Returning home he sent out Fernando Vivanco, an energetic young engineer, who proceeded to acquire extensive holdings in the Maconí district for Messrs. Oscar & Thomas Braniff. He denounced a large area, and in doing so discovered that Beaurang had no title to many of the properties claimed by him, so Vivanco properly took possession of the lapsed claims for his own people. During the following two or three years he did a good deal of exploratory work, principally in what is now known as the La Negra mine.

During 1904 the United Mining & Development Company of America, a New York corporation, took an option on the Maconí group of mines, and spent some money in building roads and other work. After a year or so this company withdrew from the district, but not because they were dissatisfied with the mining prospects. About this time Victor Beaurang died, and Messrs. O. & T. Braniff purchased from his estate its entire holdings in the district, comprising the El Doctor, Valenciana, Santo Entierro, and many other mines, consolidating them with their own. Thus they came into undisputed possession of every mine of any consequence in the district, with absolute title from the Federal Government, and they are still the owners. In March, 1906, I was engaged by the Messrs. Braniff to take charge of the mines, effect a reorganization of the local forces, and place the mines and smelters in such condition that profitable operations might result.

Taking the district as a whole the geological conditions are not complicated. A great belt of crystalline magnesian limestone crosses the country above beds of shale and limestone, of Cretaceous age. Where dikes intrude, the limestones when pure have been altered to crystalline marble, or when impure, to a garnetiferous rock, for a considerable distance from the dikes. During upheaval, especially near the dikes, there has been folding, and even re-folding, so that the younger series of strata are found below the older. An abundance of Cretaceous fossils exist, chiefly in the marbleized limestone, although some have also been observed in the lime-shale. A few marine shells have been picked up on the surface of the ground.

Sedimentary strata, iron-stained mountain slopes, prominent dikes, and high marble cliffs are the distinguishing geological features of the district.

It is said that the El Doctor mines were discovered and worked by the Spaniards soon after the conquest, but it is thought by some that they may have been worked by the Chichimeca, or Otomi Indians, because near at hand on top of a large flat mountain, accessible from one point only, are the ruins of what appears to have been a large fortified city. The walls are of great length, and still of considerable height, built of roughly-shaped

slabs and blocks of lime-shale and limestone. There must have been a large population there at some time and it is possible they were engaged in working the mines. It is said that the El Doctor vein was discovered accidentally by some Indians who built a fire on the outcrop, thereby fusing the lead and silver. The principal ore-shoot has been worked almost continuously from grass-roots to a vertical depth of 500 metres, with a maximum length of 13 m. and the ore was of good grade all the way. When the old miners reached a vertical depth of 250 m., the difficulties of extraction, unwatering, and ventilation, became so great that they were obliged to go across the ridge and start a cross-cut adit, the present Socavón, to strike the ore-shoot. This adit was driven in small sections for a distance of 883 m. The ore was cut and operations were carried down until the conditions again became too difficult and the work dragged along and was finally suspended for a number of years until Beaurang arrived on the scene. This adit has a single track, is fairly straight, of good size and grade, and is lighted with incandescent lights. An old roadway, or *galera*, to the outcrop is kept open as a means of ventilation for the lower workings, now 250 m. vertically below the adit. Near the face of the adit an incline has been sunk; overhead a chamber has been cut out in which is installed an electric-driven friction-drum hoist, operating a skip, with a capacity of about a metric ton (2,204.6 lb.) of ore per trip.

The geological formation is similar to the rest of the district, but while there is abundant evidence of intense metamorphism, there is a total absence of eruptive rocks or dikes, as elsewhere. At the upper contact, between the limestone and shale, the former has been highly crystallized, but is not garnetiferous. This gray and white marble reaches the surface, and forms great white cliffs along the outcrop of the vein. Geological conditions in the mine are fairly uniform, however, and there are not many signs of disturbance after the ore was formed.

The ore-shoots follow strong fractures in the sedimentary strata, occurring in a contact-vein between the underlying unaltered blue limestone and overlying lime-shale, that passes into a calcareous slate with depth; but the largest deposits and best ore are found between the shale hanging and upper crystalline limestone, or coarse-grained marble. In places the lode is entirely within the marble, and has the appearance of a fissure-vein, elsewhere it is made up of a net-work of lime and calcite streaks with ore between. The swells in the marble near the contact always contain the largest deposits. Sulphide ore also enters the shale and slate in the shape of pipes or tubes. Isolated irregular orebodies are also found filling cavities in the blue limestone, and are traced by means of small stringers leading away from the regular deposits. Large bunches of calcite are encountered, and near these usually occur deposits of carbonate ore of good grade.

The mine has always been worked in early Mexican fashion, following the ore, and as the shoots were persistent in depth they simply went down on them and did not explore along the strike to look for more. When the shoots begin to thin out toward the edges work is stopped. Practically all of the ore-breaking is done by *busecones*, and when the vein is reduced to half a metre in width the *barreteros* (drillers) will not follow it any longer unless it is rich, so that in reality the boundaries of the ore-shoots are not ascertained yet, because many faces exist where the ore is either narrow or low-grade, and it has often been found that the ore will open out from half a metre to two or three metres within a few metres of driving, with a corresponding increase in rich-

ness. Between the ore-shoots (in the direction of the strike) is a zone of lode-matter or ferruginous clay, containing a high percentage of iron and alumina, with from 250 to 500 grams of silver. This material is tightly packed and no doubt prevented the ore-bearing solutions from penetrating, the ore becoming concentrated along the larger fractures or watercourses where the rock was more open.

The average width of the ore is about six feet. The gangue minerals consist of calcite, quartz, dolomite,



Cake of Silver From the Cupel in Refinery. 124½ Kilograms.

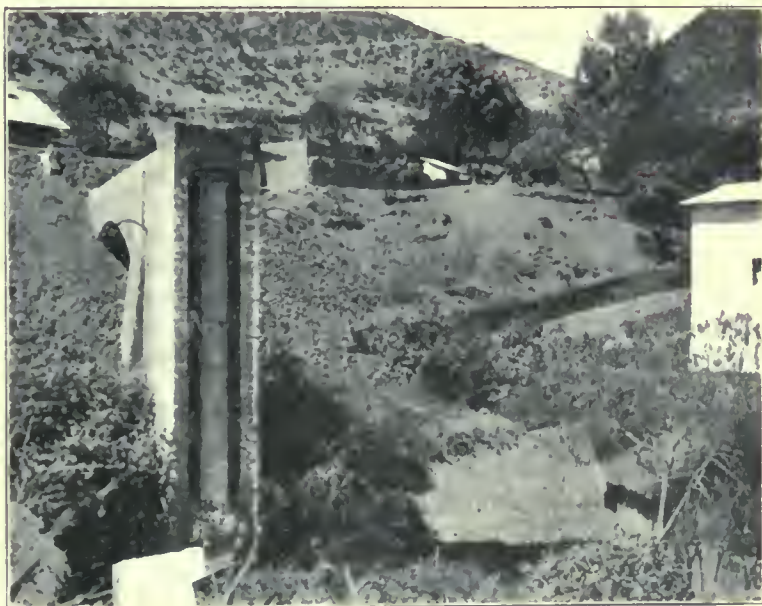
gypsum, and calamine, native silver occurring in vugs of the last. There is a great quantity of iron oxide in the vein-filling. In places the ore is hard and dense; in others, especially in the ducts between orebodies, a large amount of low-grade vein-matter may exist with only a pay-streak on the foot-wall side that is soft and friable. The compact ore is always the best. The walls are often smooth and slickensided, showing native silver in sheets more than an inch square on the smooth faces. Where this occurs the ore is of good grade and will average six to seven kilograms in silver for a distance of six inches or so from the streak of native silver. The general average of the ore brought to the surface is about one kilogram (32.15 oz. Troy) of silver per metric ton. The ore does not contain much lead, the average being about 1%; the other components are iron and copper pyrites, some zinc blende, antimony, and arsenic, most of the silver being with the iron pyrite and gangue. It is aimed to extract as little ore as possible under a kilo in silver, therefore care is exercised underground in breaking and sorting as far as the light will permit.

Ventilation is poor, candles will not burn, and petroleum lamps are used. Often the flow of carbonic acid gas is so strong that the men are driven out of the workings for several hours, and at such times quicklime is introduced to absorb the gas. After this is slacked and exhausted it is gathered up and used for building walls and pillars. The Company pays P2.50 per metric ton for kilo ore in the mine, with a deduction of 15% of the weight for waste and moisture in the *patio*, the miner furnishing his own light and explosives, but the Company furnishes sharpened tools and moves the ore. As there are a number of individual contractors, much sampling and assaying of the various lots of ore has to be done, and in general careful supervision is necessary,

because the *buscones* are tricky. Nothing can be accomplished with the natives by day's pay, and if they are given explosives they are either extravagant in their use or will endeavor to carry them out of the mine to be traded for *pulque* or reserved for feast-days. On the other hand when they are obliged to furnish their own explosives, they will do little drilling or blasting, and will chip at the ore with *emas* (gads), resulting in the production of an excess of fine for the smelters. Good ore must be found for the *buscones* or they will not work. Where development is in ore it has been found best to pay the men a small price per metre of advance and pay them at the regular rate for the ore broken, otherwise they will shoot ore and waste together or assist their friends working close by to annex the ore to their own piles, to the detriment of the Company. The price paid per metre of development varies from P12 to 15, the latter price being paid for winze or shaft-sinking.

Mining methods are crude as yet and partake of the nature of primitive Mexican mining, following the ore regardless of level. The ore is carried from the stopes to the shaft on the backs of *peones*, who average about five *arrobas* (126.76 lb. Avoird.) per trip, or 120 *arrobas* (3,042.35 lb.) per shift. The men earn from 60 to 75 centavos per day and the small boys about 45 cv. The *buscones* earn from 50 cv. to P1 per day, which is about the average in ore or development work. The *peones* rarely work more than five days per week and neither do the *barreteros*. If the latter are lucky and make a little extra money on their contract during the week it means that they will work a less number of days during the following week.

The ore from the stopes is dumped into chutes, let into the hanging wall of the shaft, and the skip is filled



Old Spanish Blowing-Tower at Maconi.

directly from these. Hardly any low-grade ore is taken from the mine; it is left behind as filling in the stopes in the form of walls, or pillars to support the roof, so there is a large tonnage of low-grade ore that can be concentrated for the smelter. No dumps of low-grade ore are found on the surface as in other old mining camps in Mexico. Not much timbering is done except for chutes and stulls. Timber is put in green usually and does not last long. During the rainy season water seeps through the rocks and gas is liberated from the lime and shale. Incandescent lights are used at points where the gas is strong. The problem of ventilation will have to receive serious attention before long.

It is difficult to maintain a uniform production from the mine on account of the irregular labor supply. When labor is fairly plentiful and the production normal, the cost per ton of ore placed in the *patio*, including ore-breaking, development, timbering, carrying and tramming, and hoisting, amounts to an average of P6.50 per ton. The ore is run out from the mine in cars and dumped over sorting screens into the ore-shed close to the mouth of the adit. Three sizes are obtained, *gabarro*, from egg size to large pieces as they come from the mine, *granzon*, down to nut size, and *arenilla*, the fine. The *gabarro* is broken by hand to suitable size for the smelter, sorted, and if oxidized is dumped with the *granzon* directly into the storage-bins alongside. The sulphide is trammed to the roasting-yards where most of the sulphur, with some zinc and antimony, are driven off by heap-roasting. The sulphide fine is made into bricks by hand with the addition of milk-of-lime and charcoal screening and roasted in circular stone furnaces. Owing to the small amount of lead in the El Doctor ores, the ores are carefully bedded in order to obtain a good smelting mixture. The ore-bed (*revoltura*) is formed of successive layers (*capas*) of oxidized ore, roasted sulphide ore, fine, matte, wall accretions from the blast-furnace, and by-products from the refinery. It is aimed to have about 10% lead in the completed bed, therefore a sample is taken of each layer and assays made so that no lead will be wasted. The silver is brought up to a kilo and over. Each bed contains about 350 metric tons, and in drawing off the mixture for the smelter a vertical face is maintained and the material is intimately mixed with shovels before charging. The ore contains sufficient silica, but lime and iron must be added. The lime is blasted from a quarry close to the smelter and is broken by native women to suitable size. When smelting operations are increased a rock-breaker can be installed at the quarry. The cost of limestone is 75 cv. per metric ton at the charging floor, but it is barren of silver. The iron is packed some distance by mule-back from a large deposit. It is of good quality and contains from 80 to 150 gm. silver per ton. The cost delivered is about five pesos per ton.

The smelting plant is a 36 by 42-in. water-jacket furnace with a capacity of 40 tons per day of all material. The blast for this furnace is supplied by a No. 4½ Baker blower, driven by a 15-hp. Westinghouse motor, and the average of the blast-pressure is from 12 to 14 oz. The furnace produces from 1½ to 2 tons per day of base bullion and about 1½ tons of matte. The base bullion averages 8 kg. silver, 6 gm. gold, 33% antimony, and 62% lead per ton, and the matte averages from 10 to 12% lead and over a kilo in silver. When the slag cones are cool the matte is knocked off, broken up, and roasted in heaps, to be returned to the ore-beds. The base bullion is ladled from a small well on the outside of the crucible into 20 kg. molds, sampled, and assayed, and either refined at the works or shipped to Germany. During the past year practically all of the base bullion produced was shipped, especially that from the El Doctor mine, because it is high in antimony, and the German people pay for the antimony concentrated in the bullion at the price of lead, and in the local refinery almost all of the antimony is lost.

The refinery is an old fashioned type of German cupel-ling furnace and is not economical, for several reasons. A poor quality of wood costs seven pesos per cord and has to be packed a long distance, and men and mules cannot be spared for this work. Half a cord of wood is required per ton of lead refined. A new cupel is necessary for each operation, and material for this has to be transported for some distance, and besides there is the cost of labor for shaping the cupel and afterward breaking it to get at

the absorbed silver and lead. Some silver is always left behind in the litharge, but of course this and the cupel material are afterward put into the ore-beds. Later on, when the production is greater, some one of the desilverizing processes will be found more economical. The recovery in the present refinery is an average of 95% silver and 85% of the lead, with the antimony almost a total loss. From 30 to 35 tons of lead bars form a charge and the run lasts for about seven days. A No. 3 Baker blower, driven by a 5-hp. Westinghouse motor, furnishes the blast for the cupel. The resulting cake of silver is extracted after cooling, broken into small pieces, melted in crucibles heated with coke and charcoal, and cast into bars, the silver averaging 998 fine. The bars are sent under escort to the railway and shipped by express to the mint at Mexico City. It has been found that although freight and treatment charges to Germany are high, aggregating P100 per ton of lead, it is more economical to ship than to refine, and no more refining is done than is necessary to furnish litharge for the *revolturas*. The lead bars are shipped by mule-back to Las Tucas, thence by wagon to Bernal, and from there to Tampico, where the bars are embarked for Germany. Each pack-mule carries an average weight of 140 kg. (308.64 lb.), and about 100 mules are employed. Mule and wagon freight amounts to P15 per ton, and railway freight to Tampico about the same. In addition to this the State and Federal tax on the silver exported has to be paid. Treatment charges are high, but a reduction has been promised.

The fuel used in the blast-furnace is a mixture of charcoal and coke, the latter from Baroteran, in Coahuila; about 12% by weight of the charcoal is used, but this varies according to the stock of the latter on hand. Coke costs P43.50 at the mine and is of fair grade. The total fuel used amounts to 20% of the charge, meaning the total ore and flux, exclusive of fuel and returned slag. During dry weather, when fodder is scarce, or during the rainy season when the roads are in bad condition, and the pack animals cannot work, more coke is used, and it is held in reserve to meet these emergencies. Charcoal is packed to the smelter from the mountains by mules and burros, probably more than a hundred being employed for this purpose, and P12 per ton delivered is paid. The Indians burn the charcoal in crude beehive ovens in the mountains. A central deposit is selected and the charcoal is carried in small lots to this point. An Indian will carry five *arrobas* (126.76 lb.) per trip and make several trips per day for long distances.

The average slag composition from the smelter is as follows: SiO₂ 33%, FeO 28%, CaO 23%, ZnO 2.5%, Al₂O₃ 10%, Pb 0.5%, Ag 60 gm. The last is considered too high, but it is a difficult matter to lower it economically. The furnace is fairly free from accretions, the campaigns are of good length, and an excess of flue-dust or fume is not formed. Taking all of the conditions into consideration, especially the size of the furnace, men qualified to judge have pronounced the work not unsatisfactory. The furnace is operated entirely with native help, and as they have had experience in the work from boyhood they are fairly proficient, but they are careless and have to be constantly watched or they will allow the jackets to burn, especially during the night shift. Charging, handling of slag and matte, and all other work in connection with the smelter, is done by hand, with inefficient labor. The average cost per ton of ore smelted, which includes breaking and sorting of the ore in the *patio*, tramping to roasting heaps and back to charging bins, roasting ore, matte, and fine, forming the ore-beds, fuel, flux, and supplies, amounts to ten pesos.

Common labor is cheap, but scarce and erratic. Each family of Indians has a small piece of land where they

grow enough corn to supply their actual wants; besides this they have a small herd of goats, and they only work in the mines to get money for luxuries. From October to February the *peones* will not work at all, and in May and June they are sowing corn. They are peaceable, but stupid and lazy, and as simple-minded as children, leaving their work on the slightest pretext. It requires patience and tact to manage them. The miners and *peones* are intemperate and observe all holidays, which are numerous, more for the purpose of loafing and drinking than respect for the day. When they are flush, from Saturday night to Sunday afternoon, their object is to eat, drink, and be merry, and when 'broke' during the balance of the week, they are hungry and wretched. They are like a large family bound together by one common purpose, which is to get something for nothing from the Company. They like amusement and welcome every occasion when they can congregate to dance and drink. A curious thing is the great distance they are able to shout from hut to hut in the mountains. The men talk business and the women gossip over almost incredible distances, and riding along the trails on a quiet morning it is interesting to hear them. On the Montezuma river there is a settlement of Otomies. They do not speak a word of Spanish, nor will they accept money or have any dealings with other Indians or outsiders.

Several things at present militate against low costs in the district, such as distance from railway, high cost of transportation and supplies, scarce and inefficient labor, irregular production, and antiquated methods that it is not feasible to change at present. In spite of these drawbacks the business is profitable, and, as many of the foregoing problems are likely to be solved, the future is bright.

The Stock Market.

Hayden, Stone & Co., of New York and Boston, make the following interesting comment on the financial situation:

There is no situation which calls more imperatively for calm, level-headed judgment than that occasioned by such an upheaval as we have seen this week. With speculative sentiment universally bearish there is grave danger of losing one's head and joining too enthusiastically in a movement which may be nearing its end. There are one or two things which are apt to be lost sight of at such a time as the present, and which it will do no harm to recall.

From all quarters not under the immediate influence of market sentiment still come reports of great prosperity. A little slowing down there has been which will in all probability go still further, but this has already been discounted. Crops, which are really the underlying factor of our prosperity, will have an average yield, and bring better than average prices; railroad earnings are still gaining, and net income, for the first time in months, is showing an appreciable increase. In other words, all factors governing intrinsic value of securities must be pronounced favorable, except the money situation.

Here we still continue to think lies the keynote to the situation, and here there is great menace. Several large underwriting payments are falling due, and the necessary provision for these, in conjunction with the already severe tension in the money market, would alone be enough to occasion a very severe break. On top of this has come strongly displayed animosity toward corporations in the Southern States. This, however, we believe is a factor which will soon come to a head, and will pass away. The people, after all, cannot do without the cor-

porations, and to cripple them would be only hitting one's nose to spite one's face. Nothing is so fickle as popular sentiment on this point, and a few more level-headed acts like that of the Governor of New York in vetoing the two-cent rate bill, would soon send the pendulum swinging the other way.

In the meantime, advantage is being taken of all the unfavorable factors to frighten holders of securities into selling them and investors from purchasing them, so that the buying to date has come very largely from covering of shorts, and as yet there is no organized support. We do not take much stock in the rumor that the Standard Oil crowd are selling securities in retaliation for the fine imposed on that company. The men behind this company would not be so short-sighted as to sell the old line issues at the lowest figures they have reached in 10 years. We are more inclined to believe that this and the attack on the Southern Railway are being used as weapons by the short interest to hammer the market and to bring out, if possible, long stock.

Boston has naturally followed New York's lead, and with no end in sight to the deadlock in the metal market, has sold copper stocks freely. Announcement is made this week of an assessment on Winona. This is rather a small company and the assessment is of little importance except as showing a tendency which is likely to be followed by others, beginning with the weaker companies, particularly with those who reopened their mines on the prospect of continued high copper; later on will come reductions in the rates of disbursements on the part of some of the dividend-paying companies. On looking back to the prices of the fall of 1906, when copper sold at 16c. per pound, and dividend rates were very much below what they are now, we find that prices averaged higher, so it is a question whether even the copper stocks, as well as the railroads, have not now pretty well discounted unfavorable contingencies.

Our summary of the situation would be that the man with money who can afford to pay outright for what he purchases will make no mistake in beginning to buy now, as the two unfavorable factors—tight money and corporation baiting—should gradually disappear in the next six months or a year. Those not in a position to do their own financing will find little to be gained by entering the market at present, as money conditions are such that it would be neither to their nor to their broker's advantage to carry their stocks, while those disposed to come in on the bearish side may perhaps reap temporary profits but should be prepared quickly to run to cover.

THE permeability or flow of water through concrete is less as the percentage of cement is increased, and in a much larger inverse ratio. The permeability is less as the maximum size of the stone is greater. Concrete with maximum size stone of 2½-in. diam. is, in general, less permeable than that with 1-in. maximum diameter stone, and this is less permeable than that with ½-in. stone. Concrete of cement, sand, and gravel is less permeable than concrete of cement, screening, and broken stone; that is, for equal permeability, a slightly smaller quantity of cement is required with rounded aggregates like gravel than with sharp aggregates like broken stone. Concrete of mixed broken stone, sand, and cement is more permeable than similar concrete of broken stone, screenings, and cement; that is, for watertightness, less cement is required with rounded sand and gravel than with broken stone and screenings. The permeability decreases materially with age; increases nearly uniformly with the increase in pressure; and increases as the thickness of the concrete decreases, but in a much larger inverse ratio.

Electric Heat v. Heat From Fuel.

The current issue of the *Electrochemical and Metallurgical Industry* has this to say on the above subject:

In our present issue we notice the last reports of our San Francisco contemporary, the MINING AND SCIENTIFIC PRESS, on the progress of the Noble Electric Steel Co.'s work at Héroult-on-the-Pit, in Shasta county, Cal. As will be remembered from our former notices this undertaking of Mr. H. H. Noble is noteworthy in two respects from an industrial point of view. If successful it will mark the beginning of the commercial manufacture of pig iron on the Pacific Coast, and at the same time it is the first commercial plant in the world in which the electric furnace enters into competition with the blast furnace. A concise analysis of the possibilities of electric heat versus heat from fuel seems timely, and it seems proper to first view the problem from the narrow point of view which is most unfavorable to the electric furnace and which simply inquires as to those relative costs of fuel and electrical energy for which the cost of the blast-furnace and of the electric-furnace treatments becomes the same. The immense importance of the element carbon in metallurgy is due to its double application as a strong reducing agent and as a fuel to produce, by its oxidation, the heat needed for the chemical reaction. In the case of reduction of iron from the ore, the blast furnace and the electric furnace require the same quantity of carbon to act as reducing agent and to combine with the oxygen in the iron oxide. But the blast furnace also requires carbon for producing the necessary high temperature, and it is only this last portion of carbon, the calorific value of which is replaced by electrical energy in the electric furnace. We will, therefore, first compare the cost of fuel and electrical energy to produce the same number of heat units.

One kilowatt-hour is equivalent to 860 kilogram-calories, which is approximately the full heat obtained from 100 grams of good coal when completely burnt to carbon dioxide. If the cost of a ton of coal of 2,000 pounds (or 907 kilograms) is a dollars, and if the efficiency of heat production by burning coal is x per cent, then the coal required for producing 860 kilogram-calories costs $a \div 90.7 \times x$ dollars. On the other hand, if the cost of 1 kilowatt-hour is b cents, and if the efficiency of producing heat from electrical energy is y per cent, then the kilowatt-hours, required for producing 860 kilogram-calories, cost $b \div y$ dollars. Hence electrical heat will be cheaper than heat produced by combustion of fuel if a/y is greater than $90.7 \times b \times x$. To go further, we need the efficiency figures x and y . By assuming definite figures we introduce, of course, an uncertainty into our comparison, but it will probably be considered fair if for a first approximation we assume a 25% efficiency for fuel heating and a 75% efficiency for the electric furnace. Then we conclude that electrical heat will be cheaper than heat produced from fuel if a is greater than $30.2 \times b$, or in words, if the cost of a ton of coal in dollars is more than 30 times the cost of a kilowatt-hour in cents. For instance, to compete with coal at \$6 per ton, the electric kilowatt-hour would have to cost less than 0.2 cent. This is clear evidence that if the electric furnace did not have other important features it could not compete with fuel heat under ordinary conditions.

We have purposely made this comparison on the basis of the cost of the ton of coal and of the kilowatt-hour, although it has become customary to use the electric horsepower-year as the unit of electrical energy in such estimates. Then the above condition can be stated in this way: Electric heat will be cheaper than fuel heat if

the cost of one ton of coal is more than one-half the cost of the electric horsepower year. Stated in this form, the comparison looks more favorable for the electric furnace than stated, as in the preceding paragraph. But in reality it is not proper to make the comparison on the basis of the horsepower-year, since we thereby implicitly assume that the electric furnace is working continuously every hour all year around, which is in general a decidedly improper assumption.

It is, of course, clear that the above comparison is exceedingly narrow in that it considers only one single side of the problem, namely, the amount of fuel and electrical energy required to produce the same number of calories. But even in this very respect the above comparison falls short of the truth and does not do justice to the electric furnace. The chief reason is that electrical heating is essentially internal heating, permitting a very high concentration of energy at any point wanted and thus enabling one to produce high temperatures. Fuel heating, on the other hand, is always more or less transmission of heat from the fuel to the charge, and the rate of heat transmission depends on the difference of the two temperatures; this rate decreases rapidly the higher we go up in the temperature. Naturally, with fuel heating we can never obtain any higher temperature than that of the burning fuel itself. There is no corresponding limitation in electric heating. This is the fundamental reason why for all very high temperature processes the electric furnace reigns supreme. This is an established fact, but since electric reduction of iron ore does not fall into this class of processes, we may not further discuss them here, except by pointing out that the possibility of obtaining higher temperatures might be found useful for special cases of iron ores; for instance, with titaniferous slags. It is of greater importance perhaps to refer to the fact established at the Sault Ste. Marie experiments that iron ores containing a high sulphur content can be successfully smelted in the electric furnace so as to get a pig iron containing only a few thousandths of one per cent of sulphur. Through the electric furnace certain iron ores will therefore become available for the production of pig iron which heretofore could not be treated economically. This will probably become more important in future years than it seems to be at present.

But there is another point. With respect to the reducing agent it was stated above that the same amount of carbon as reducing agent is required in the electric furnace as in the blast furnace to rob a certain amount of iron oxide of its oxygen. This is perfectly true, but it would be absolutely wrong to conclude that the electric furnace has therefore no advantage in this respect over the blast furnace. The point is that the blast furnace requires coke, while charcoal or peat coke will do very well in the electric furnace. This point is at the bottom of the whole situation in California. On account of coke not being available, California has not had its own pig iron industry. At the new plant on the Pit river there is unlimited timber for charcoal making. Viewed from every point the undertaking of Mr. Noble looks promising, especially if we consider that pig iron sells in San Francisco at about \$10 more than in Pittsburg. Let us hope that the work which was officially inaugurated on our national holiday, the Fourth of July, will turn out commercially successful. It would be a matter of great industrial importance for California and would stimulate similar progressive work in other districts where the conditions appear sufficiently favorable for electric smelting and sufficiently different from the conditions in our present blast-furnace centres. In the latter centres electric smelting for reduction of iron from ore is, of course, out of the question.

Oil in the State of Vera Cruz.

Written for the MINING AND SCIENTIFIC PRESS
By EZEQUIEL ORDOÑEZ.

In an article published in the 'Memorias de la Sociedad Alzate,' I explained the geological conditions prevailing in the Gulf-coast lands of Mexico near Tampico, Tamaulipas, in 22° latitude. These geological conditions were discussed in connection with the presence of heavy asphaltic oil found there in extensive seepages distributed all along the coast. The oil finds its way up through a uniform formation of shale of unknown age and more than 4,000 ft. thick. On account of the uniformity of constitution and the slight importance of stratigraphic accidents due to tectonic agencies, the strata are almost horizontal, with gentle undulations and low domes, similar in shape to the mounds of Texas,

carries a sandy material, consisting of small sharp pieces of shale, fine lapilli, and volcanic sand. This shows that the material referred to comes from the places where the oil is accumulated around the volcanic pipes, at a greater or less depth. Such regions impregnated with oil surrounding the solid or tufaceous core, are really in some cases the zones of friction caused by the upward movement of the lava, sufficiently cooled to rise as a solid body and to find its way to the surface, like the obelisk of Mont Pelé. In the tufaceous cones the oil contains fragmentary volcanic material that has fallen back into the chimney during explosive eruption. The more productive wells come, of course, at the base of the cones of this kind, by reason of the permeability of such material as has been shown in the wells drilled at the base of the Cerro de la Pez in the El Ebano oilfields, the *cerro* being composed of tufa. The Mexican Petroleum Co.



although not, of course, of the same origin. The impervious condition of the shale has forced the oil to reach the surface only through vertical borings, chimneys, or pipes drilled upward by volcanic action during the Pliocene and perhaps post-Pliocene times. The evidences of such curious volcanic pipes, well known to geologists in regions having volcanoes of the explosive type, are found here in the form of small isolated cones, ranging from a few feet to four or five hundred feet in

height. These cones of volcanic origin, spread over the coastal peneplain, are easily recognized, being the only objects of any topographical importance in an undulating region. Some of the cones are of solid basaltic lava (sometimes nepheline basalt); others are of basaltic tufa. At the base of these cones, or in their neighborhood, are to be found the greater number and more important seepages of oil. The shale strata have not suffered disturbance near the cones; however, as oil-seepages are found at a distance from volcanic cones, it is presumed that the thick strata have at least been cracked during volcanic outbursts, or that the oil existing there has forced its way to the surface through points of abortive eruption. The truth of the hypothesis herein set forth respecting the geological conditions existing was practically demonstrated during the drilling operations conducted by the Mexican Petroleum Co. at Ebano, near Tampico. In the more highly productive wells of this company the heavy oil, abundantly charged with gas,

has obtained, from but a very few wells around this hill, a daily output of 6,000 barrels. It is my purpose here to show that the conditions above described prevail, with but unimportant variations, in an extensive zone of the Gulf-coast lands, or at least in the southern half of the State of Tamaulipas, and the northern half of the State of Vera Cruz. I have recently made an examination of this region during a trip lasting three weeks, taken for the special purpose of



Poxteitilla Mountain.

height. These cones of volcanic origin, spread over the coastal peneplain, are easily recognized, being the only objects of any topographical importance in an undulating region. Some of the cones are of solid basaltic lava (sometimes nepheline basalt); others are of basaltic tufa. At the base of these cones, or in their neighborhood, are to be found the greater number and more important seepages of oil. The shale strata have not suffered disturbance near the cones; however, as oil-seepages are found at a distance from volcanic cones, it is presumed that the thick strata have at least been cracked during volcanic outbursts, or that the oil existing there has forced its way to the surface through points of abortive eruption. The truth of the hypothesis herein set forth respecting the geological conditions existing was practically demonstrated during the drilling operations conducted by the Mexican Petroleum Co. at Ebano, near Tampico. In the more highly productive wells of this company the heavy oil, abundantly charged with gas,

investigating the oil possibilities there. From data acquired during this trip I am convinced that the reserves of heavy oil existing there, and to be exploited in the future, are enormous, possibly sufficient to supply fuel for the entire railway system of the Republic of Mexico. The only obstacle that seems to stand in the way of the immediate development of the oil industries of Mexico lies in the frequent difficulties arising between the owners of the lands and the oil corporations. These difficulties originate in the extremely unfavorable terms granted to the land-owners by the first contractors or promoters. After this there came naturally a reaction in the form of unreasonable demands made, in turn, by the land-owners. Added to this there exists an inadequacy in the provisions of the law in the matter of working the sub-soil without acquiring the ownership of the surface. The result is that the only safe way to develop the oil business is for the oil corporations to own the fee-simple in the soil. This follows as a consequence of the legal

principle of Mexican law that oil, like coal, is not subject to 'denouncement.'

There is nothing, perhaps, more pleasing to the geologist, after crossing the mountains of the Sierra Madre Oriental in a direction from west to east, than to cast the eye over the coastal plains of the Gulf of Mexico from the view-point of the last elevations of the Sierras facing the plains. If this view is made from the mountains bounding the Huasteca de Vera Cruz, as, for example, from a point near the town of Chicontepec, the whole perspective is still more interesting, on account of the great number of cones, peaks, and pyramids of volcanic origin distributed over the plains. These hills, brown in color, stand out clearly and distinctly from the green plain, which appears, by reason of the distance, to be entirely level and uniform. The most prominent feature visible is the Sierra de Tantima, an isolated group of high mountains standing not far from the shore-line. To the south follow isolated volcanic cones and peaks, real necks, so numerous and of such shape as to present a landscape reminding one of the classic drawings of Geikie and Dutton. Continuing the journey to the Coast, so as to place ourselves in the centre of the region described, we shall see that the cones are distributed without order and independently one of the other. The most important group of necks is in the neighborhood of the intersection of the boundary lines of the cantons of Chicontepec, Tuxpan, and Tantoyuca, and about 50 miles from the sea, from which some of them are visible.

The undulating lands, out of which these cones arise, are, as we have already stated, composed of a thick formation of shale, interbedded with limestone and sandstone in thin layers, the whole probably of upper Cretaceous age. These strata are very slightly folded or undulated, except in a few places. Some of the steeper cones, instead of arising directly from the plain, stand on a conical base, with gently sloping sides, which consist also of basaltic rock, and represent the remnants of small lava streams. The point from which this lava has flowed is marked by the steep peak that crowns the hill.

While it is true that the form of the volcanic necks, caused by erosion, tends more or less to a cone, still the difference between the consistence of the lava in the neck itself and that of its base, has caused certain difference in shape, making the core steep and fantastic in form, whereas the base of the cliff preserves sometimes the original contour of the chimney.

Some of the necks have one side steeper than the other, due to the effect of the strong northern rainy winds so frequent in our Gulf-coast lands during winter. For this reason one of the necks, called Tepenahuatl, 450 ft. high, measured from its upper base, has the form of a triangular pyramid, its northern facet being rocky and steep. Similar, though less pointed, is the neck called Morallillo, standing near Tepenahuatl but lower in altitude. But the most prominent and beautiful basaltic core of the region here described is that called Poxtectitla, a magnificent, solid, basaltic pyramid, measuring 650 ft. above its conical base. Its northern cliff is almost vertical and quite inaccessible, and is finely striated as a result of the columnar structure of the lava. The Tepenahuatl, Morallillo, and Poxtectitla hills are all covered with dense vegetation on their southern slopes. Tepenahuatl and Poxtectitla, as visible from the sea, present the appearance of two black needles, and to the seamen are known as Los Gregorios (The Watchmen). The gently sloping bases of these two hills rise 400 and 500 ft., respectively, above the level of the coastal plain, making the total height 850 and 1,150 ft., respectively. The coast land here is 350 ft. above sea-level.

Some small rocky masses, black in color, stand out

from the large bases of the hills above described, bearing evidence to secondary volcanic outbursts. Around Poxtectitla there are three interesting examples of these volcanic masses; that furthest to the east is called Cerrito de Francia; the one to the extreme north is an excellent example of the pyramid. From the accompanying sketches a good idea can be formed of the general appearance of the mountains mentioned.

To enumerate and describe any number of other hills of volcanic origin to be found in the same region would require more space than is at my disposal. There is one other, however, that demands special mention; it is called Tenexcuila and stands on the Hacienda de Tlacolula. It rises from a large basaltic base, and its appearance, from a distance, is that of the conventional cap of liberty, owing to which circumstance it is known to the natives as El Gorro de la Libertad. Like the other hills of this region, this also displays a steep cliff on the northern side, showing the columnar structure of the basalt. The prismatic division of the lava of the necks is in contrast to the irregular structure of the lavas at the base, which latter structure is similar to that of our common malpais.

The oil seepages being found, as I have stated, in the neighborhood of volcanic hills, are, however, of more frequent occurrence near the isolated volcanic peaks than in places where such peaks are closely grouped and surmounted on large bases. The reason for this apparent anomaly is that the extensive basaltic lava stream at the base of the neck constitutes a formidable obstacle to the upward flow of the heavy oil from the base of the neck to the extremity of the lava stream.

In the coastal plain lying between Tampico, Tuxpan, and Papantla will be found the greater number of volcanic hills and the more important and densely distributed oil-seepages of Mexico. I shall name a few of them. Near the Laguna de Tamiahua there exists a large pool of asphaltic oil, close to the twin volcanic hills known as Los Hermanos. Not far from the Sierra de Tantima is another big, dry, asphaltic lagoon. On the Hacienda de Tlacolula we found two oil-seepages, one on either side of the basaltic hill called Temaxcales. The large volcanic mountain near the Hacienda de Tamatoco gives birth to several exudations of oil. On the eastern side, and not very far from its base is found one of the larger seepages, named La Chapopotera de Juan Felipe, having an extent of one-half mile. The Chapopoterías de Cerro Viejo, those of the Hacienda del Chapopote, and others nearer Tuxpan, are also extensive and important.

Recent discoveries of oil in the State of Coahuila and in northern Tamaulipas show geological conditions somewhat different from those above described and a different quality of oil. These will form the subject of another article.

TIN MINING IN CORNWALL.—Cornish tin mining points to a revival. As long as the Americans delay developing the deposits in South Dakota and in the Southern States, so long will the Cornish mines profit through the lack of rivalry. There is no doubt that an enormous quantity of tin still remains to be extracted from the Cornish hills. Many old mines, which ceased working when the bad times came some 30 years ago, were closed, not because they had not an abundant deposit of tin ore, but because the market was flooded with foreign tin, which was then being produced at a price with which the deep and costly Cornish working could not compete. This foreign supply has now greatly diminished, and the world again turns for its supply to Cornwall. Old mines are being reopened and new claims started.

Technical Methods of Analysis.

By W. A. SEAMON.

*The differences in results obtained by different chemists on the same pulps do not lie so much in the differences of methods employed, or to imperfections in the methods themselves, as in the varying fidelity of the analyst in executing the details of treatment. Imperfection in execution of methods is due in part to the rapidity with which technical chemists are compelled to work; but, I wish to call particular attention to the imperfect executions due to deficient understandings and appreciation of the importance of adhering to the details and successive steps in the methods employed.

Most of the technical methods have been, in recent years, fairly well studied and the *raison d'être* for their successive steps are well understood by the more thoughtful chemists. It, however, frequently happens that, on certain ores, certain details of treatment may be modified, or omitted, with advantage. Chemists who have found these things have, sometimes at least, condemned the original method. So long as their work has been confined to the particular classes of ores on which they have been working they have not discovered the danger, or fallacy, in their modifications; finally, they have come to the conclusion that their modifications are good for all classes of ores, and gross errors have followed—the result of the development of a supreme confidence based upon limited experience.

The criticisms I make are not new and I make them only because I feel we have lost sight of the real essentials for good work, in a vain effort to find a universal method which may be followed mechanically and yet give uniform results. For many determinations I have, from time to time, employed different methods and have usually found, after I had learned to understand the methods, that results by different methods checked well with each other.

First in importance is the preparation of the pulp. How frequently discrepancies in results are eliminated by re-grinding the pulps is a common experience with most technical chemists. The improvement in results comes from the more perfect mixture, made possible by making the particles smaller and more nearly uniform in size, as well as by increasing the working power of the solvents. With the grinding machines now available we should insist upon being furnished with finer ground pulp—the finer the better, particularly for wet determinations.

There is room for great improvement in the type of balance made for analytical work. At present the best balances employed have a sensibility of only one-tenth of a milligram, making the factor of error from the balance, when a half-gram charge is employed, equal to 2100 of 1%. This error is probably more than doubled by the rapidity necessary to weigh up a day's run. I have employed a button balance, with a sensibility of one-fiftieth of a milligram, for important wet work with improvement in my results. The small size of the pans is the objectionable feature and has caused me to recommend that balance makers make a balance with short beam, with sensibility of one-fiftieth of a milligram, and capacity of only about ten grams, to be used exclusively for wet work. The pans should be from one and one-half to two inches in diameter. Such a balance will help considerably in doing better work; but it alone will not remedy all evils. No chemist can be sure of his results unless he frequently tests the equilibrium of his balance while

weighing up his day's work—the more frequently the better. The accuracy of the weights should be tested weekly, keeping for this sole purpose a set of standard weights that have been most thoroughly checked. In my own experience I frequently find the equilibrium disturbed to the extent of one milligram after only a few weighings. Such a disturbance corresponds to an error of $\frac{2}{10}$ of 1% in a result. It is foreign from my purpose to discuss the reason for such disturbances of equilibrium; the simple fact that they may occur at any moment is the point to be borne in mind.

When we come to the first acid treatment we reach the stage where most of the discrepancies have their origin. The assayer puts on the specified amount of acid and places the assay on the hot plate, when the active portion of the acid evaporates more rapidly than the water, and takes for granted that decomposition has been accomplished. I happen to have a southern window which receives the sun up to the middle of the afternoon and I always allow the acids to act in the cold for half an hour, then give the assays a sun-bath for another half hour. By shaking the vessels, the analyst can always tell whether or not decomposition appears to be as complete as is possible to secure with conventional treatment; my own experience has taught me that, as a rule, assays are placed too quickly on the hot plate. Then there is the most important point of knowing with a reasonable degree of certainty that the ore has been decomposed; without that knowledge all results must be looked upon with a degree of suspicion.

Evaporations to dryness should be conducted slowly, with care enough to avoid sputterings, thereby throwing portions of the assay on the covers. It is frequently difficult to prevent this, but it should be prevented as far as possible. A thin sheet of paper placed between the plate and the vessel I often find effective. Evaporation over a water-bath is perhaps generally too slow for use by a technical chemist, but a metal box kept filled with dry steam might prove more satisfactory than the hot plate for certain ores.

Uniformity of results in determination of insolubles cannot be expected, and it is far better for us to work to eliminate this determination than to seek to improve it. This matter lies mainly with the ore buyers; if they would fix their schedules to provide for a 'true silica,' uniformity in results could be expected. In my own experience I have come to the conclusion that difference in elevation at which the assay is made affects the results for an insoluble. The same pulps usually give a higher insoluble in Denver than they do here (at Chihuahua, Mexico), where the elevation is nearly 2,000 ft. lower. This may be accidental or due to some other cause; but, as the differences are relatively the same, I have come to the conclusion that the difference in atmospheric pressure causes a sensible difference in the solvent power of the acids.

A great deal of good work has been done by many chemists in working out methods and, as it is important that all should understand the methods thoroughly, it seems to me that in publishing results we should go to extremes in describing the reasons for each treatment; for all of us cannot take the time to work out for ourselves all of these points. If this were done there would be less departures from the methods and there would more rigid adherence to instructions. When the analyst understands the purposes of the treatment and tries to note whether the object of each step in treatment has been accomplished, greater uniformity will be secured and the data for improvement in methods will be found.

Too much stress is laid upon checking with duplicate assays; while duplicate assays should be made to guard

against error, it is of far higher importance to know whether each assay has been properly made. One determination made carefully is of far greater value than any number of assays (no matter if the results do check) in which the analyst cannot say with positiveness that the object of each step in the treatment has been accomplished. The greatest errors I have made have been due to too strong reliance on checks. Checks made on succeeding days are of some value. I think I voice the experience of all technical analysts when I say that good checks are usually made on days when we are not crowded with work, and that when we are crowded good checks are seldom obtained.

In all volumetric work analysts should work with constant bulks, and solutions should be restandardized, at every run, with quantities of the standardizing substance corresponding to the percentage of the constituent in the ore (not because the standard varies daily, but to be surer of constant conditions).

We have heard a great deal about scientific methods of analysis as compared with technical methods, usually to the disparagement of the latter. I wish to place myself distinctly on record as protesting against these claims. Scientific chemists do not check with their so-called scientific methods any more closely than technical chemists do. Examine carefully articles on determinations of atomic equivalents; note the elaborate care employed in preparing absolutely pure salts; also the care and time taken in making the analyses; and yet, with all this care, you will generally find a statement to the effect, that "after rejecting all discordant results the following were selected as sufficiently accurate to serve as a basis for calculation." Absolutely accordant results are unattainable for several reasons, among which may be mentioned imperfections in method and separations, of which none are perfect; there is no balance, or instrument, which does not possess its factor of error—sometimes these factors of error will balance each other, but sometimes they are all plus, or all minus, when the total factor becomes large enough to make differences which cannot be neglected; then there is the individual factor of error (perhaps sometimes known, but probably an unknown variable), for which correction can never be made. While I voice my protest against the validity of the claims for superiority of so-called scientific methods and analysts, I do say that the results of a scientific chemist are more likely to be accurate than those of a technical chemist. Not because of any superiority in method employed, or of ability in the analyst, but for the reason that the scientific chemist can take the time to test each step in his progress, and can know (if he wishes to do so) whether he has accomplished his work, and he is for these reasons better able to speak positively of the value of his work. Most of the technical methods are capable of yielding results equally as reliable as the so-called scientific methods, and many of them are capable of yielding more accurate results. We should not lose sight of the fact that the work of technical chemists is constantly being checked and rechecked, and that any errors are sure to be brought to light. The scientific chemist does not have to measure up to the same searching inspection of his results and, until he has been subjected to it, he has no right to boast of his supposed superiority in skill nor of methods employed.

Technical chemists must work rapidly, and it may frequently be impossible to pause at each step for even a cursory examination to make sure that each step has been accomplished; more can be done, however, in this respect than is usually attempted. I feel that we should educate each other up to a better understanding of the reactions and purposes in our treatments, which will

lead to a greater fidelity in adherence to the details of methods, and will most speedily eliminate the serious differences which from time to time occur.

Another thing much to be desired is the development of a disposition to acknowledge mistakes—when mistakes are made. There is too much bluffing by some of our oldest and best chemists. Having by years of hard work and careful attention built up a business so large that they have to employ assistants (who, from lack of experience or other reasons, occasionally make errors), they will not acknowledge those errors, even when they discover them; they hope to save their reputation by boldly asserting that they have repeated their work and obtained the results reported.

Assayers doing umpire work cannot be too particular in discharging that important function. They should never lose sight of the fact that the chemists, representing the buyer and seller, and working regularly on the ores, better understand the nature of the ores and are, therefore, more capable of judging of the relative values of varying results. Instead of trying to bluff they should make an effort to learn something of the peculiarities of the ores, either by their own work, or through correspondence with the assayers representing buyer and seller. Those of us who are engaged in control and umpire work should never lose sight of the fact that we occupy semi-judicial positions, striving to reach a result just to both buyer and seller.

In common with other chemists I would gladly welcome methods which would give concordant results by simply following them mechanically; but, thirty years' experience as a teacher and practitioner convinces me that such a method is but the idle dream of a lazy person. Thorough training in theory and manipulation; more investigation and fuller freedom in sharing our experiences and the acknowledging of our errors will do more to eliminate cause for criticism of our work than anything else we can do. First, let us understand what we are trying to do; next, do it; and lastly, let us know that we have done what we have tried to do.

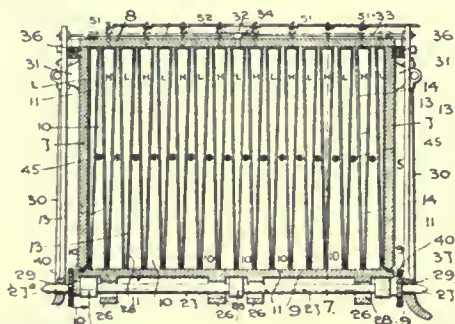
Finally, I suggest that (1) the best methods for technical chemists are to be found in volumetric methods, (2) that the best volumetric methods are those in which the constituent to be determined has been most freed from other constituents, previous to titration. The use of aluminum in the separation of copper previous to titration by any conventional method, or by electrolysis, has made the determination of copper the most accurate of any analytical method. This is a purely technical method; for, it has been developed by technical chemists, working alone and in the face of the criticism of scientific workers. I comprehend fully the boldness of this statement, and will gladly defend the proposition, if challenged to do so.

BY FAR the largest proportion of the tin used in the arts is employed for making tin-plates. The total weight of the tin on the plating is said to average 5% of the total weight of the sheet, and there has been in the past great difficulty in recovering this tin by a commercially profitable process, in spite of the high price of the metal. That contained in the solder used in making the joints of the tin can be, and is, recovered by simply heating the tins sufficiently hot to cause the solder to flow; but this process is useless as a means of recovering the rest of the metal, which feat is now being successfully accomplished at Copenhagen by the Bergsøe process. In this a solution of stannic chloride is passed over the tinned surface, when it takes up further tin forming the stannous salt. The latter is then electrolyzed, the additional tin dissolved is deposited, and stannic chloride re-formed.

MINING AND METALLURGICAL PATENTS.

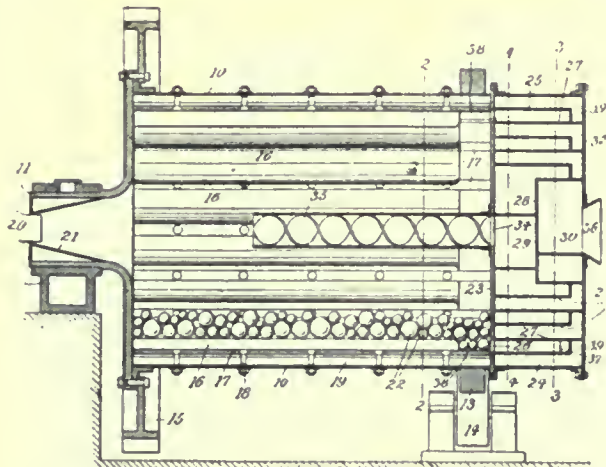
Specially Reported for the MINING AND SCIENTIFIC PRESS.

FILTER-PRESS.—No. 862,286; Laurence S. Schoenfeld, Jamestown, Colorado.



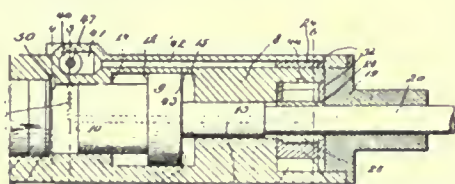
In a filter-press, a series of perforated hollow filter members, spaced in unchanged relation to each other during the entire cycle of operations, means to feed matter into the intermediate spaces, means to discharge fluids from the interior of the members, and means for discharging the residue from the spaces.

GRINDING-MILL.—No. 860,782; Max F. Abbé, New York.



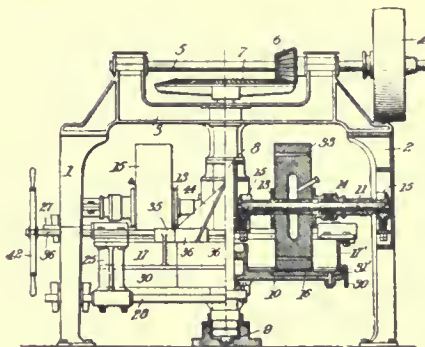
A grinding-mill composed of a rotatable cylindrical grinding chamber, a communicating screening chamber, a spiral screen and a spiral conveyer within the screening chamber and rotatable therewith, the convolutes of said screen and conveyer surrounding the axis of the mill, means for returning the tailings from the screen to the grinding chamber, and means for discharging the ground material from the conveyer.

PERCUSSIVE DRILL. No. 862,770.—Harry P. Taylor, Salt Lake City, Utah.



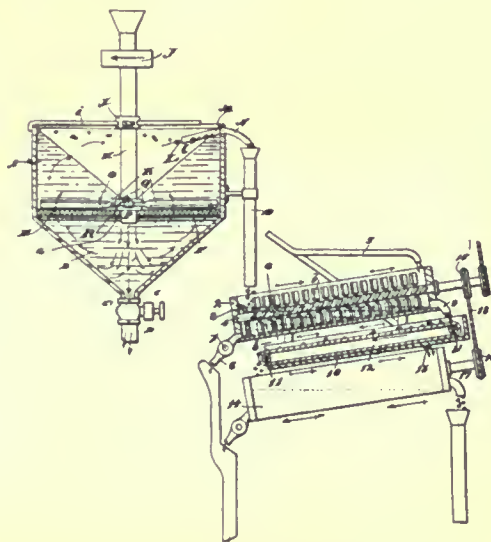
A percussive device comprising a reciprocating hammer operating in both directions by a charge of working fluid, a tool-rotating mechanism, means for supplying a charge of working fluid against one end of the hammer for reciprocating it in one direction, and means for conducting the said charge of working fluid from the said end of the hammer to against another portion of the hammer and to said tool-rotating mechanism, causing thereby the operation in one direction of said tool-rotating mechanism and the reciprocation of the hammer in an opposite direction to that caused by the supplying of the charge against the end of the hammer.

GRINDING-MILL.—No. 860,788; William R. Cunningham, Bucyrus, Ohio, assignor to The American Clay Machinery Co., Bucyrus, Ohio, a Corporation.



In a grinding and mixing mill, the combination with a rotatable pan, and grinding mullers beneath which said pan rotates, of a hinged door at the side of the pan and opening outwardly therefrom, said door having fixed to it a scraper which is normally out of contact with the floor of the pan when the door is closed, but which is moved toward said floor co-ordinately with the outward movement of the door.

PROCESS FOR SEPARATING MINERALS.—No. 851,600; James F. Latimer, Toronto, Ontario, Canada.



The process of separating graphite and similar substances from rocky matter and gangue, consisting in mingling the crushed ore with oil; delivering the oil-provided mass to, and maintaining it in, an upflowing current of water; centrifugally agitating the mass to separate the components and so accelerate the current as to carry the oil-provided graphite to the top of the water; flowing the so separated graphite away; settling the gangue through a current of reduced speed below the zone in which the material is fed and agitated, and removing said gangue by a downwardly-flowing current.

SMEETING-FURNACE.—No. 862,684; George G. Vivian, Denver, Colo., assignor of one-half to Lafayette Hanchette, Salt Lake City, Utah.



A reverberatory smelting furnace comprising a hearth, a combustion chamber communicating therewith, a slag tap adjacent said combustion chamber, and a matte or metal tap remote from said combustion chamber.

New Traction Engine.

Many experiments have been made in the past few years, looking to the use of traction engines for hauling lumber, ore, etc., and these experiments have proved so satisfactory that the demand for engines for such purposes has largely increased. A saving of 25 to 50% of the cost of hauling can be effected by the use of steam-engines in place of horses, and in many cases where mining and lumbering operations could not be carried on at all on account of the large expense of transporting the product, the use of steam-traction engines has so decreased the cost as to make operations profitable.

The four main requisites of a traction engine are durability, power, ease of handling, and speed. Attention is called herewith to the new Avery undermounted double-cylinder locomotive traction engine. This engine is built upon new principles, and repeated tests have shown that it possesses many points of superiority over the old-style engines where the cylinders are mounted on the top of the boiler. In the latter the boiler is the real frame of the engine, the cylinder and gearing being all attached to the boiler by means of brackets. All the strains incident to heavy hauling come

boiler if one contemplates its having a long life. In this engine all the strains come on the steel frame, and the durability of the engine is thus largely increased. The power developed by the cylinders is transmitted through the gearing and applied to the pull on the load in a direct line, instead of pulling down from the top of the boiler at an angle of from 45 to 90°, as with top-mounted engines. Repeated tests have proved that one of these undermounted engines has a pulling capacity of at least from 15 to 25% more than any other engine of equal rated horsepower. The amount of power that a certain sized engine can develop is one of the most important questions which contractors, lumbermen, and miners will consider, and is certain that an Avery undermounted engine will appeal to them strongly in this respect also.

Commercial Paragraphs.

HENRY TROEMNER of Philadelphia has been given the order for several new scales and balances intended for the San Francisco Mint.

C. A. LUCKHARDT Co., assayers, for the past year temporarily established at Oakland, have entered permanent



Avery Undermounted Double-Cylinder Locomotive Traction Engine.

on the boiler, which soon shows the effect of the steady pulling in leaky bolts and loose brackets, and the life of such an engine for continuous hauling purposes is short. The fact is that while the demand for traction engines for hauling has grown and has been brought to the attention of manufacturers, most of them have failed to appreciate how different are the demands on an engine that is to be used for continuous hauling purposes as compared to a threshing engine, a large part of whose power is to be expended in belt-work for driving the separator. Some manufacturers have attempted to meet this demand by simply reinforcing their gearing and building larger engines, but in doing so they have not in any way avoided the real difficulty, that of relieving the boiler from the great strains incident to hauling heavy loads. The Avery Manufacturing Co., of Peoria, Ill., having built one of the best top-mounted engines on the market, saw that the demands on an engine for hauling purposes were entirely different from those on an engine that was to be used for threshing and, fully realizing that no top-mounted threshing engine could successfully meet these requirements, they devised the new Avery undermounted double-cylinder engine. In this engine the cylinders and gearing are mounted on an independent steel frame-work, and the boiler is entirely relieved of all strains. All that is required of it is simply to generate steam, which it is easily seen should be the only thing required of the

quarters at 53 Stevenson St., within a few feet of the site of their old plant, which they occupied for nearly half a century before the fire that devastated San Francisco.

THE WM. POWELL Co. of Cincinnati has mailed a catalogue of their brass and iron specialties. A valuable series of tables and rules is bound in with the catalogue, giving in a concise form information that every engineer and shop manager requires in his daily practice.

G. G. GATES, 149 Beale St., San Francisco, who installed the first successful canvas tailing plants in Calaveras and Amador counties, has arranged with the Goodyear Rubber Co. for the manufacture of a new concentrator-belt for both end and side-shake machines of the Frue and Johnson types. He is also making a new tandem-table machine of the Wiltley type.

THE ECLIPSE DRILL SHARPENING MACHINE MFG. Co., of 1,701 Blake St., Denver, has recently installed two of its drill-sharpeners at the plant of the Colorado Central Power Co., at Shoshone, near Glenwood Springs, Colo. The power company is installing a large plant of machinery for generating electric power for use on the western slope of the Rocky mountains. Jos. Retallack, the manager, has recently placed on the market a coke furnace and sliding rack for heating drill-bits, to be used in connection with the drill-sharpener.

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TABLE OF CONTENTS

Editorial:	Page.
Notes.....	253
The Hearst Memorial.....	254
By the Way.....	255
General Mining News.....	257
Special Correspondence.....	262
Denver, Colorado.....	
Butte, Montana.....	
London.....	
Toronto, Canada; Mexico City.....	
Concentrates.....	267
Discussion:	
The Royal School of Mines... W. Fischer Wilkinson	268
Erosion and Oxidation in Sonora... F. J. H. Merrill	268
Concentration of Slime..... Wilton E. Darrow	268
Articles:	
Opening of the New Mining Building of the University of California.....	270
California Ore Testing Company.....	272
Keeping Account of Supplies.—I.....	
Matt. W. Alderson	274
Education of Mining Engineers..... T. A. Rickard	275
The Clean-up, Melting, and Refining of Gold Bullion..... Gerard W. Williams	277
The Fairchild Vacuum-Filter.....	279
The McDougall Roasting Furnace..... L. S. Austin	280
Automatic Water Gauge.....	284
Smooth-On.....	284
Mining and Metallurgical Patents.....	283
The Prospector.....	282
Departments:	
Personal.....	256
Obituary.....	256
Market Reports.....	256
Commercial Paragraphs.....	284
Books Received.....	284
Publications Received.....	284

Editorial.

WE ARE INFORMED that the United States Geological Survey is taking up the examination of mineral claims located on forest reservations. Mr. Waldemar Lindgren has charge of this work. The Survey has already done good service in getting evidence concerning the mineral character of land claimed to be agricultural by railroad companies and others anxious to acquire large tracts of the public domain.

ACCORDING TO information emanating from a press bureau, it appears that F. Augustus Heinze is willing to work with the Guggenheims; at least, he is not desirous of competing with them in the ore market of Salt Lake. The building of the new Heinze smelter on the south shore of the lake is, we are assured, no sign of an impending conflict between clever people, but only the evidence of the irrepressible activity of an energetic captain of industry. As they say in funeral notices: Country papers please copy.

THE CONVICTION of several men implicated in the imposture of the Lost Bullion Spanish Company at Denver, is another credit to the post-office inspectors. Two mining engineers are among those convicted, and it is likely that the punishment of them will serve as a warning. On the face of it the whole affair was a fraud, although no worse than many schemes hawked in the pages of several so-called mining papers. It is a pity that the regulations against the fraudulent use of the mails cannot be enforced against the periodicals which, under the guise of giving advice, are the lure of the faker.

REVERBERATIONS of the financial storm in New York and Boston are still echoing across the continent. The President's speech has prodded several editors to sarcasm and even to protest, and all of these molders of public opinion are not hirelings of the financiers. To the people on Wall Street the vicinity of Washington is ominous and to those that live in New York the activity of the Stock Exchange is a vital fact, for speculation is so general on Manhattan island that few men, even professors and editors, escape the snare of it. Hence the President's lack of sympathy for the nerves of the speculator and his disregard of the intense strain to which business is being subjected, provoke their resentment. Mr. Roosevelt ought to have, so they say, more feeling for a delicate situation, and he ought to recognize the danger of an assault upon national credit. "Into a room where credit lies nervously ill, he bursts with a shout and a club," so says the *Evening Post*. And yet those at a distance, away from the dust arising from "the stamping ground of the great herd" on Manhattan

island, are in sympathy with the President in his vigorous efforts to assert the right of the community to check the predatory methods of the big corporations. Temporary disquiet on the bourses of the country is bound to arise from any attempt to disturb illegal practices among those in control of public utilities, but this should not deter the enforcement of justice. In the meanwhile it is well once more to state that the sickly condition of the 'Street' is not due to threats against unscrupulous financiers; it is the evidence of a worldwide condition, varied by local characteristics. During the present month the decline in stocks quoted upon the London Exchange has reached the staggering total of \$680,000,000. Since the beginning of 1907 the depression is measured by \$1,725,000,000, of which one-third is in American railroad shares. The biggest losses have been in the South African mining market, where quotations have been amputated to the extent of 25 per cent. No wonder the money markets are groggy. The water is being squeezed out of stocks and the process leaves a feeling of acute discomfort. It was inevitable.

OUR CORRESPONDENT in Mexico sends us an important letter concerning the increased freight rates levied by the railroads. It will be remembered that the Mexican Government has recently effected a consolidation of the main lines within the Republic, and it was hoped among those engaged in mining that this would mean a better management. During the last year or two the shortage of cars on the Mexican Central and the consequent slow delivery of the material needed in mining and smelting has seriously hindered profitable operations. Some of it was due to a big increase of business, but much of the car shortage was traceable merely to lack of management, as has been the case on this side of the Rio Grande. Now we learn from our correspondent that not content with a wretched administration, the railroad companies propose to increase their tolls to a prohibitive degree. It is time for mine operators to make a vigorous protest.

The Hearst Memorial.

ON OTHER PAGES of this issue we give an account of the ceremony that marked the formal opening of the new Mining Building of the University of California. The building is a memorial to George Hearst and is the gift of his widow, Mrs. Phoebe Hearst, whose thoughtful munificence has provided the University at Berkeley with several splendid structures and a general plan of construction destined to make the State University worthy of its noble site at the foot of the Contra Costa hills, facing the Golden Gate.

It is claimed, and justly, that this is the finest building in existence that is devoted solely to the cause of mining education; certainly it is a noble edifice, built of an exquisite stone and designed both as to beauty and utility in such a way as to do honor to the donor and the architect. We rejoice in the good fortune of the department of which our friend Professor Christy is dean, and in the added facilities provided for a college, the gradu-

ates of which constitute a notable group in the profession of mining and metallurgy.

But there is another aspect of the event that stirs thoughts not unmixed with regret. At the opening, the generous woman to whom the University owes the building—and much more—was accompanied by her son William Randolph Hearst, one of the most prominent of the public men of America. As a newspaper proprietor on a tremendous scale, as a candidate successively for Mayor and Governor of New York, as an aspirant for the Presidency of the United States, he has loomed large in the public eye during the last few years. He has given to the University of California its Greek theatre, one of the truly classic buildings on this continent, and he participates in the gratitude evoked by the munificence of his mother. For this the community honors him, but, at the risk of seeming barbarously ungracious, we venture to say, in a paraphrase of Dooley and Kipling, that "the more we remember, the less we forget." No university in America today is so potent an educational force for good as Mr. Hearst's newspapers are for evil. In four or five cities of this Republic he publishes a crop of journals, each of which preaches every day the gospel of hatred and undermines all the best instincts of popular government. A benefaction to a State University deserves the thanks of the community, and will get it, but not without a thousand regrets that the multifarious abilities of a forceful man should be expressed in a species of enterprise that is so utterly anti-social. At the opening of the building dedicated to his father's memory, he made a good speech, full of optimistic patriotism calculated to stir a vibrant chord in the young men before him—the young men whose best impulses and highest principles are debauched by the wretched sheets scattered broadcast by him every morning in the name of journalism. What a power for good the half dozen Hearst newspapers could be if they were different in every respect, except ability and energy! It is a fact that the average citizen reads a serious book once in six months and a newspaper twice a day. That is why the daily newspaper is so potent a force in shaping the thought of the country. It is the medium through which the members of a modern community get the larger part of their information on current affairs. The publisher of a single paper has great power to educate or pervert the public mind, and the proprietor of half a dozen dailies has a proportionately larger scope for disseminating ideas, good or bad, and distributing information, true or false. If the periodicals controlled by Mr. Hearst were pulling on the same side as the University to which his honored mother has given so generously, then the cause of good citizenship would be enormously strengthened; but as it is now, the University is dedicated to ideals which he does his best every day to shatter. By preaching the gospel of hatred, by stirring the mud puddles of social life, by misinformation on current affairs, by the slander of good men, by the support of bad ones, by a policy that is wholly anti-social, he is doing his best to oppose one of the chief purposes of an American University, namely, the development on right lines of popular government in these United States.

By the Way.

At the recent meeting of the British Association for the Advancement of Science, the President, Sir David Gill, said:

One of Clerk Maxwell's lectures at Aberdeen, when I was a student under him there, in 1859, ran somewhat as follows:

"A standard, as it is at present understood in England, is not a real standard at all; it is a rod of metal with lines ruled upon it to mark the yard, and it is kept somewhere in the House of Commons. If the House of Commons catches fire there may be an end to your standard. A copy of a standard can never be a real standard, because all the work of human hands is liable to error. Besides, will your so-called standard remain of a constant length? It certainly will change by temperature, it probably will change by age (that is, by the rearrangement or settling down of its component molecules), and I am not sure if it does not change according to the azimuth in which it is used. At all events, you must see that it is a very impractical standard—impractical because, if, for example, any one of you went to Mars or Jupiter, and the people there asked you what was your standard of measure, you could not tell them, you could not reproduce it, and you would feel very foolish. Whereas, if you told any capable physicist in Mars or Jupiter that you used some natural invariable standard, such as the wave-length of the D-line of sodium vapor, he would be able to reproduce your yard or your inch, provided that you could tell him how many of such wave-lengths there were in your yard or your inch, and your standard would be available anywhere in the universe where sodium is found."

That was the whimsical way in which Clerk Maxwell used to impress great principles upon us.

Now the scientific world has practically adopted Maxwell's form of natural standard. It is true that it names that standard the metre; but that standard is not one-millionth of the earth's quadrant in length, as it was intended to be; it is merely a certain piece of metal approximately of that length.

It is true that the length of that piece of metal has been reproduced with more precision, and is known with higher accuracy in terms of many secondary standards, than is the length of any other standard in the world; but it is, after all, liable to destruction and to possible secular change of length. For these reasons it cannot be scientifically described otherwise than as a piece of metal whose length at 0° C. at the epoch A.D. 1906 is = 1,553,161 times the wave-length of the red line of the spectrum of cadmium when the latter is observed in dry air at the temperature of 15° C. of the normal hydrogen-scale at a pressure of 760 mm. of mercury at 0° C.

The ancient philosophers were confident in the adequacy of their intellectual powers alone to determine the laws of human thought and regulate the actions of their fellow men, and they did not hesitate to employ the same unsupported means for the solution of the riddle of the universe. Every school of philosophy was agreed that some object which they could see was a fixed centre of the universe, and the battle was fought as to what that centre was. The absence of facts, their entire ignorance of methods of exact measurement, did not daunt them, and the question furnished them a subject of dispute and fruitless occupation for twenty-five centuries.

But astronomers now recognize that Bradley's meridian observations at Greenwich, made only one hundred and fifty years ago, have contributed more to the advancement of sidereal astronomy than all the speculations of preceding centuries. They have learned the lesson that

human knowledge in the slowly developing phenomena of sidereal astronomy must be content to progress by the accumulating labors of successive generations of men; that progress will be measured for generations yet to come more by the amount of honest, well-directed, and systematically discussed observation than by the most brilliant speculation; and that, in observation, concentrated systematic effort on a special thoughtfully selected problem will be of more avail than the most brilliant but disconnected work.

By these means we shall learn more and more of the wonders that surround us, and recognize our limitations when measurement and facts fail us.

Huggins's spectroscope has shown that many nebulae are not stars at all; that many well-condensed nebulae, as well as vast patches of nebulous light in the sky, are but inchoate masses of luminous gas. Evidence upon evidence has accumulated to show that such nebulae consist of the matter out of which stars (that is, suns) have been and are being evolved. The different types of star spectra form such a complete and gradual sequence (from simple spectra resembling those of nebulae onwards through types of gradually increasing complexity) as to suggest that we have before us, written in the cryptograms of these spectra, the complete story of the evolution of suns from the inchoate nebula onwards to the most active sun (like our own), and then downward to the almost heatless and invisible ball. The period during which human life has existed on our globe is probably too short—even if our first parents had begun the work—to afford observational proof of such a cycle of change in any particular star; but the fact of such evolution, with the evidence before us, can hardly be doubted. I most fully believe that, when the modifications of terrestrial spectra under sufficiently varied conditions of temperature, pressure, and environment have been further studied, this conclusion will be greatly strengthened. But in this study we must have regard also to the spectra of the stars themselves. The stars are the crucibles of the Creator. There we see matter under conditions of temperature and pressure and environment, the variety of which we cannot hope to emulate in our laboratories, and on a scale of magnitude beside which the proportion of our greatest experiment is less than that of the drop to the ocean. The spectroscopic astronomer has to thank the physicist and the chemist for the foundation of his science, but the time is coming—we almost see it now—when the astronomer will repay the debt by wide-reaching contributions to the very fundamenta of chemical science.

By patient, long-continued labor in the minute sifting of numerical results, the grand discovery has been made that a great part of space, so far as we have visible knowledge of it, is occupied by two majestic streams of stars traveling in opposite directions. Accurate and minute measurement has given us some certain knowledge as to the distances of the stars within a certain limited portion of space, and in the cryptograms of their spectra has been deciphered the amazing truth that the stars of both streams are alike in design, alike in chemical constitution, and alike in process of development.

But whence have come the two vast streams of matter out of which have been evolved these stars that now move through space in such majestic procession?

The hundreds of millions of stars that comprise these streams, are they the sole ponderable occupants of space? However vast may be the system to which they belong, that system itself is but a speck in illimitable space; may it not be but one of millions of such systems that pervade the infinite?

We do not know.

Personal.

E. W. STEBBINS is at Spokane.

M. E. MACDONALD is at New York.

CHARLES BUTTERS is at Washington.

W. H. RADFORD is at Fairbanks, Alaska.

ALBERT BURCH has gone to Wardner, Idaho.

J. H. CURLE is on his way to the Malay States.

T. H. LEGGETT will open an office at New York.

DOUGLAS WATERMAN has returned from work in Plumas county.

J. R. CAHILL is visiting the mining regions of Peru and Bolivia.

W. E. DEFTY is examining mines in Yavapai county, Arizona.

HAROLD S. GAY is in San Francisco on his return from Honolulu.

JOHN B. KEATING, of the Bully Hill mine, is at San Francisco.

J. PARKE CHANNING is expected at Seattle on his return from Alaska.

THEODORE J. HOOVER will come to the West from London in September.

JAMES M. HYDE is with Charles Butters & Co. at Virginia City, Nevada.

LUTHER W. BAHNEY is now instructor in metallurgy at Stanford University.

M. T. CHESTNUT & SON have opened a Denver office in the Century building.

HERBERT HAAS is now in the service of the Union Iron Works, San Francisco.

SEELEY W. MUDD sailed on August 22 from Liverpool on his return from Europe.

M. F. PERRY is manager for the Creston Colorado Co., at Torres, in Sonora, Mexico.

JOHN A. CHURCH sailed from San Francisco on the *Asia* for Nagasaki on August 27.

NEWTON B. KNOX passed through San Francisco on his way from Japan to London.

C. W. EVANS has returned to Ashland, Oregon, from the inspection of mines in Curry county.

GEORGE S. TYLER, superintendent of the Nelson mine, Quincy, Cal., has been in San Francisco.

S. H. BROCKUNIER has not accepted the mine management at Silverton. He is now at Denver.

H. VINCENT WALLACE has returned to Nogales from a visit to the dredging districts of California.

CHARLES PALACHE, professor of mineralogy in Harvard University, is at his home in Berkeley.

CHARLES JANIN has completed the inspection of mines near Silver Cliff, Colorado, and is now at Denver.

H. A. SHIPMAN and R. J. GRANT have taken new offices in the Ernest & Cranmer building, at Denver.

W. S. G. TODD is superintendent for the East Fork Development & Mining Co., at Boulder Creek, California.

E. J. BUMSTED has left Velardeña, to become manager of the San Francisco mine, at Ocotlan, in Oaxaca, Mexico.

HARTWELL CONDER has joined the firm of Alexander Hill & Stewart, mining engineers, and will act as their Australian representative, with offices at Melbourne.

Obituary.

THOMAS CORNISH, formerly superintendent of the Terrible and other mines near Georgetown, and then of Stratton's Independence, at Cripple Creek, died on August 22 of pneumonia, while at Stenika's ranch, in southern Nevada. He was 57 years old, and had been engaged in mining in the Silver Plume, Leadville, and Cripple Creek districts since his arrival in Colorado in 1868.

Latest Market Reports.

LOCAL METAL PRICES—Aug. 29.

Antimony.....	17.00@20.00c	Quicksilver (flask).....	\$38@39.50
Copper.....	24.00@25.00c	Spelter.....	7.00@ 7.75c
Pig Lead.....	5.35@ 6.30c	Tin.....	42.50@ 44.00c

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.

Date	Electrolytic Copper	Lead	Spelter	Silver
Aug. 16.....	18	5 1/4	5.63	69 1/8
" 17.....	18	5 1/4	5.63	68 7/8
" 18.....	Sunday.	No market.		
" 19.....	18	5 1/4	5.63	.....
" 20.....	18	5 1/4	5.63	68 7/8
" 21.....	17 7/8	5 1/4	5.63	68 7/8
" 22.....	17 7/8	5 1/4	5.63	67 7/8
" 23.....	17 3/4	5 1/4	5.57 1/2	67 3/4
" 24.....	17 3/4	5 1/4	5.57 1/2	68 1/4
" 25.....	Sunday.	No market.		
" 26.....	17 3/4	5 1/4	5.57 1/2	68 1/4
" 27.....	17 3/4	5 1/4	5.57 1/2	68 3/8
" 28.....	17 3/4	5 1/4	5.57 1/2	68

ANGLO-AMERICAN SHARES.

Cabled from London.

	Aug. 22. £ s. d.	Aug. 28. £ s. d.
Camp Bird.....	0 19 0	0 19 3
El Oro.....	1 4 3	1 5 0
Esperanza.....	2 0 0	2 0 9
Dolores.....	1 5 0	1 5 0
Oroville Dredging.....	0 16 6	0 16 6
Stratton's Independence.....	0 2 6	0 2 6
Tomboy.....	1 8 0	1 8 9

(By courtesy of W. P. Ronbright & Co., 24 Broad St., New York.)

MINING STOCK QUOTATIONS—NEW YORK.

Closing Prices. August 28.

Bingham Central.....	1 1/4
Boston Copper.....	20 1/2
Cumberland Ely.....	9 1/8
Dolores.....	5 1/2
El Rayo.....	3 1/2
Guanajuato Con.....	25 6
Giroux Con.....	6 3/4
Greene Con.....	7 3/8
Nevada Con.....	10 3/4
Nipissing.....	8 1/8
Tennessee Copper.....	34 1/4
Tonopah Ex.....	1
Tonopah-Belmont.....	2 1/4
Tonopah.....	10 3/4
United Copper.....	52
Utah Copper.....	23 1/2

(By courtesy of Hayden, Stone & Co., 25 Broad St., New York.)

SOUTHERN NEVADA STOCKS.

San Francisco, Aug. 29.

Belmont.....	3.00	Mohawk.....	19.00
Combination Fraction.....	2.02	Montana Tonopah.....	3.00
Daisy.....	1.47	Nevada Hills.....	5.20
Fairview Eagle.....	1.25	Red Top.....	3.80
Florence.....	4.10	Sandstorm.....	44
Goldfield Con.....	7.52	Silver Pick.....	53
Jumbo.....	3.80	St. Ives.....	81
Jumbo Extension.....	1.77	Tonopah Extension.....	1.10
Laguna.....	1.50	Tonopah of Nevada.....	11.00
Little Tonopah.....	1.25	West End.....	70

(By courtesy of W. C. Ralston, 368 Bush St.)

COPPER SHARES—BOSTON.

Closing prices.

Closing prices.

Name of company.	Aug. 29.	Name of company.	Aug. 29.
Adventure.....	2 1/2	Michigan.....	12
Ahmeek.....	60	Mohawk.....	69
Allouez.....	33	Nevada Con.....	10 3/8
Amalgamated.....	70 1/4	North Butte.....	64 1/2
Arceadian.....	5	Old Dominion.....	29 1/4
Atlantic.....	13	Osceola.....	106
Balaklala.....	7 3/8	Parrot.....	14 1/4
Bingham Con.....	12 1/4	Phoenix.....	1
Boston Con.....	20 1/2	Quincy.....	89 1/4
Butte Coalition.....	19 1/4	Raven.....	1 1/4
Calumet & Arizona.....	150	Rhode Island.....	3 1/2
Calumet & Hecla.....	714	Santa Fe.....	21 1/4
Centennial.....	21 1/2	Shannon.....	137 1/4
Con. Mercur.....	39	Superior & Pittsburg.....	14 1/8
Copper Range.....	64 1/8	Tamarack.....	75
Daly-West.....	13 1/2	Trinity.....	16 1/4
Franklin.....	10	United Copper com.....	54
Granby.....	100	Utah Copper.....	42 1/2
Greene-Canaan, etc.....	12 1/4	Victoria.....	57 1/8
Isle Royal.....	15 1/4	Winona.....	5 1/4
Mass.....	4 3/4	Wolverine.....	143

(By courtesy of E. F. Hutton & Co., 490 California St.)

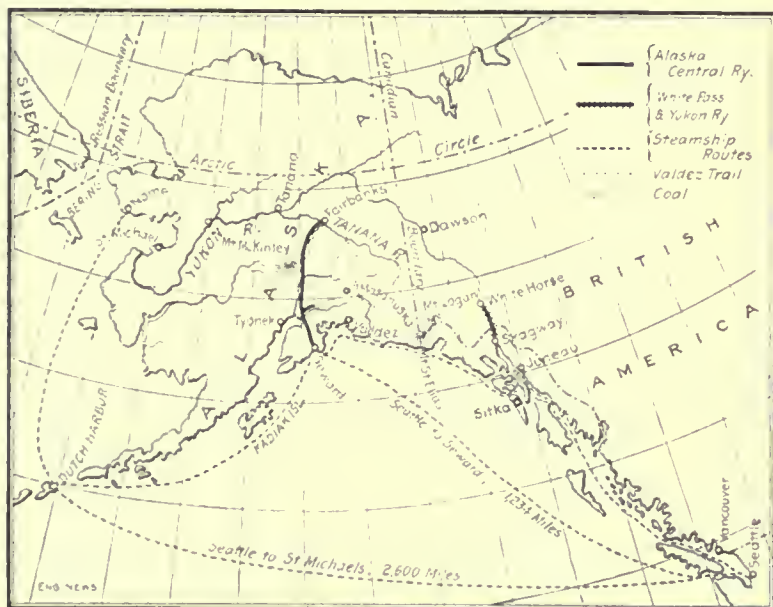
General Mining News.

ALASKA.

While it is true that the Guggenheims have three dredges in the process of installation on Hunker, and own a good deal of ground, still there are many patches of good ground which are not controlled by them, especially a large number of creek claims on upper Hunker. Among the Hunker hill claims that have not been gobbled up are the Temperance, Whisky, Delhi, Nugget, Australian, and various others, while among the creek claims that have not been grabbed by the giant combine are the Gold Bottom above No. 30, Last Chance, Hester, Henry Gulch, and Eighty Pup.—The Guggenheim holdings on the main Hunker extend from the mouth to 30 below, with the two exceptions of the claims 47 and 49, now being worked by individuals, and take in Dago hill. Above 30, or virtually from the lower end of Gold Bottom town to the head of Hunker, are 42 claims, and from the town to the head of Gold Bottom creek are 40 claims, making a total of more than 80 creek claims contiguous on the upper end, which

women, in Minneapolis, to take over the hornblende-garnet vein near the mouth of the Stikine river, about seven miles from Wrangell. The garnets are hard and pure, and will be cut and polished in Minnesota.—Coal, coke, and ore are arriving at the Hadley smelter, and a long and continuous run should be possible. There is still a little difficulty in getting fluxing ores for the charge.—The Alaska Galena Co. has been organized to develop the Moonshine properties, purchased from McCallion, Hoover & Patterson. W. W. Catlin is the manager and Milnor Roberts superintendent. A camp has been established on the beach on the south arm of Cholmondely sound, seven miles from Chomly, and a trail built from the beach to the mine on the ridge of Granite Mtn. About 100 tons of galena ore has already been mined.—A shipment of 350 tons of gypsum was recently made from Chicagoff island, and 100 tons of marble from Calder.

The U. S. Geological Survey is doing a great deal of work this season, investigating the mineral resources of Alaska. The copper deposits in the valley of Chitina river, a tributary of Copper river, are being re-examined by Fred H. Moffit, assisted by A. G. Maddern. This field is important because of the large amount of development now going on within it. Mr. Moffit will make a reconnaissance down Copper river, and may visit the more important districts of the Prince William Sound copper district.—Investigations of the coal resources of the Territory, begun last year, are being continued by W. W. Atwood, who reached south-eastern Alaska in the early part of May, and spent a month studying the coal-bearing rocks of that district. He next visited the Yukon coalfields, as far as they are accessible from the Yukon river. He is assisted by H. M. Eakin.—In accordance with the plan of mapping the important mining districts in detail, the ore deposits of the Ketchikan mining district, in Kasaan peninsula, Prince of Wales island, south-eastern Alaska, are being studied by C. W. Wright and Sydney Paige. A contour map on a scale of an inch to the mile is in preparation as a base for the work.—The tin deposits of Seward Peninsula, both lode and placer, are being examined by Adolph Knopf, who is to make a special study of the manner of occurrence and mode of origin of the ores.—A contour map of Kasaan peninsula, on the



Map of Alaska.

are not gobbled. The Gold Bottom ground nearly, if not all, has been organized into one group. S. G. McLellan was the organizer. Temperance hill and a number of other hills and benches adjoin upper Hunker and Last Chance.—In the development of the Candle Creek placers, 11,000 tons of coal were used last year. This coal was mined within 12 miles of where it was used. Candle creek is a tributary to Kiwalik river, which flows into Kotzebue sound.

In the Ketchikan district there is a congestion of ore at the Jumbo, owing to the lack of transportation facilities, and all the bunkers, holding 4,500 tons, are full. The daily production of the mine is about 100 tons of ore.—The Mt. Andrew mine can arrange for the freighting of only about 4,000 tons per month.—The Cymru property will soon be worked again. About 900 tons of ore from this mine are stocked at Coppermount, awaiting shipment.—The Red Wing has just shipped a cargo of ore to the Tacoma smelter.—About 50 sacks of copper ore were recently shipped from the Peterson property on Cat island.—J. H. Hazlett, representing Chilberg & Davidson of Seattle, who recently purchased the Goodro & Thomas copper property on Karta bay, has gone to the mine for the purpose of making a 500-ton trial shipment to the smelter, and if the returns are satisfactory, an aerial tramway and bunkers will be built.—E. W. Molander has gone to the Hadley smelter to install a hot-blast attachment to the smelting furnace, which is expected to effect a saving of coke.—The Alaska Garnet M. Co. has been organized entirely by

inch-mile scale, is being made by D. C. Witherspoon. On the completion of this work Mr. Witherspoon will map, on the scale of one-half inch to one mile, the region between the international boundary west of Dawson, Y. T., and Fairbanks, Alaska, adjoining the southern boundary of the area already mapped in this region. J. W. Bagley is assisting him.—Alfred H. Brooks, the geologist in charge of the Division of Alaskan Mineral Resources, will be engaged in office work in Washington until mid-summer. He will then visit southeastern Alaska, the Fairbanks district, and Seward Peninsula, paying particular attention to economic developments in the various fields.

ARIZONA.

COCHISE COUNTY.

Parker Woodman has been appointed to the superintendency of the Copper Queen mines, to succeed S. W. Clawson.—A strike of copper ore is reported from the Scherrer property at Johnson, at a depth of 45 ft. San Francisco people bought the property some weeks ago, and Emile Allen is the manager. Two earloads of ore have been shipped to Douglas, and two more await shipment. This property adjoins the Republic, which has been a regular shipper for two years.—George Myers reports a strike on the His Royal Highness claim of the Black Queen group, two miles east of Paradise, near the top of the divide between Silver creek and Round valley. The property is held on a two-year bond and lease. Some good ore is being exposed

in other properties at Paradise. The Snowball shaft at the Savage is down 170 ft. and some good ore is showing. The Scanland tunnel, after running 450 ft. and attaining a depth of 300 ft., shows good ore, and in the Horace incline on the same group the ore has held to the present depth of 150 ft. —The Doran & Gallagher shaft is 100 ft. deep.

MOHAVE COUNTY.

(Special Correspondence). — The Arizona-Southwestern Copper Co. has commenced sinking a 200-ft. shaft on the Simamese group of claims in the Cedar Valley district, situated between Big Wallapai Mtn. and Hackberry, to cut a vein that crops out on the surface, and which can be traced for a long distance. In a 16-ft. shaft, samples have been taken running \$28 in gold, copper, silver, and lead. Copper is the predominant metal. The ore is an excellent concentrating material. There are many natural advantages, such as timber and water, but as the district is a new one, this is the first company to undertake mining. There is a small hoisting plant on the ground, which was packed in on burros in sections. This plant will suffice to reach the 200-ft. point. The officers of the company are: Geo. L. Hibbs, president, Doylestown, Pa.; L. Hoffman, vice-president and general manager, and J. H. Hoffman, secretary and treasurer.

Prescott, August 27.

The first payment on the McCracken group of mines was made this week. The mines are about 30 miles from the Santa Fe railroad, and if the deal goes through it will mean much to this county.

YAVAPAI COUNTY.

(Special Correspondence). — The outlook for a good ore-body in the Little Daisy shaft is growing brighter as sinking progresses. The manager states that the present hoist will soon be replaced by a new one of larger capacity, another boiler is to be installed, and as soon as a site is determined on, a double-compartment working shaft will be sunk. — The Jerome Mines Development Co. has for several months been operating a diamond-drill on its property. It is stated that they have cut sufficient ore to warrant the opening of a mine, and are at present sinking a double-compartment shaft. — Superintendent Martin, of the Sycamore Mining Co., reports that work on the new shaft is progressing rapidly, having gone 70 ft. in 30 days, and that the new No. 9 Cameron pump is handling the water easily. — A tunnel is being run by contract on the Eureka property, in Black canyon, to cut the main vein. The contractor reports good headway, and says that another 100 ft. ought to show something good. — Tom Taylor, superintendent of the United Verde smelter, has returned to Jerome after an extended absence.

Jerome, Aug. 25.

The hoisting plant and air-compressor have been installed at the mine of the New England-Arizona M. Co., near McCabe, and power drills are at work. — Good reports come from the Nigger Brown mine in the Black Canyon district, where the shaft is down 200 ft. — The Flour Gold Placer M. Co., operating on Humbug creek, is employing 35 men, and the flume will soon be finished. — A hoisting plant has been purchased to sink a double-compartment shaft on the property of the Logan Copper Co., in Copper Basin. — Copper ore is exposed in the bottom of the 300-ft. shaft on the Storm Cloud group in the Hassayampa district, 12 miles south of Prescott. — The New York-Arizona Copper Co. has its shaft down 460 ft., in the Black Hills. Nearly 200,000 gal. of water per day must be handled. — John S. Jones announces that a reduction plant, with a capacity of 120 tons per day, will be built at the Little Jessie property.

CALIFORNIA.

BUTTE COUNTY.

George H. Sisson has made partial payments toward the purchase of several properties in the Magalia district, and it is reported that he has purchased an option on the McGibbons mine, and on the Matheson property. — A good deal of development work is being done on the Mammoth Channel property.

CALAVERAS COUNTY.

The members of the local miners' union at Angels Camp voted to reject J. V. Coleman's offer of 9 hr. per day for underground workers, top men to work 10 and 12 hr. per day, as before the lockout. Subsequent to this action, Coleman withdrew his offer.

NEVADA COUNTY.

(Special Correspondence). — It is reported that sinking will soon be resumed at the Central shaft. A large amount of development work is under way, and the mine is looking well. — At the Brunswick the working force is being steadily increased and the mill is treating ore of a good grade. — The work of unwatering the Kenosha is progressing rapidly. — The Niagara is showing up well, and the management is pleased with the results thus far obtained. — The New York-Grass Valley Co. announces that it must secure \$65,000 before October 1, or suffer the attachment of its property. To meet this difficulty, the Prudential Mining Co. has been organized to raise sufficient funds. If the stockholders pay off the indebtedness in the stipulated period, the property will remain in their hands. All title to the mine will be conveyed to the Prudential Co., which will be composed of New York-Grass Valley shareholders. They have received circulars from the management urging them to join the new company in order to protect their interests. — In the Randolph Flat section, some promising prospects are being developed. — Several small placer properties are being operated on Deer creek, and some of the men are getting good returns. The late rains furnished an abundance of water for placer mining in this district. — Conservative estimates indicate that the production of the Grass Valley district for the present year will be approximately \$1,300,000. The miners' strike and heavy rains in the spring greatly retarded production. — The California mine is shipping copper ore to Kennett. A large body of ore is being developed. — The copper miners of this county are seriously considering the installation of a small smelter at some convenient point. At present only the highest grade copper can be profitably mined, but with the installation of a nearby plant, the deposits of low-grade ore could be handled at a profit. — The Miners' Union has declared war on the wood trust, and will set aside \$10,000 to purchase firewood for its members. The union officers state that they will ship in wood from outside districts and sell it at cost prices.

Grass Valley, Aug. 27.

The Horseshoe Mining Co. has purchased the Phoenix mine, on Gold hill, from the Eastern owners. The same company owns the Eclipse property. W. B. Simmons will be in charge of the work, and W. J. Bruce of Tonopah is the prime mover in the organization. The property was last worked eight years ago, when a hoisting and pumping plant was erected and a 10-stamp mill built. The shaft is down 500 ft., and was once a good producer, being known as the Sneath & Clay property. — Some good rock has been encountered in the Niagara mine, near Newton, at a depth of 200 ft. This company recently levied an assessment of 5c. per share on its stock, to meet the final payment due the Williams brothers on the purchase price of the property. C. A. Hurst, representing a pool of shareholders in Illinois, is said to control the company. — A big restraining dam is to be built across the Greenhorn river, above the Narrow Gauge bridge, and the Red Dog gravel mine, owned by J. S. Goodwin & Co., will be hydraulicked. Robert Richardson will superintend the construction, which will require two months, the dam being 35 ft. high. The gravel to be worked is in some places 200 ft. deep. — The Banner shaft has been pumped out and all the workings are dry. The shaft is 900 ft. deep, and drifts are to be run each way on the vein. Bulkheads will be built in the upper levels, to hold back the water and save a large amount of pumping. It took 38 days to unwater the mine, and mining men think it may become a good producer. — A new compressor for the Union mine, on Banner hill, has arrived and is being installed. When it is in place, sinking will be resumed.

Reports state that a large vein has been encountered in the Pennsylvania shaft of the Soulsby mine on the 500-ft. level. This may be the old vein that was lost years ago.—Good ore is showing in the shaft of the Confidence mine. The vein has been cut in four places, showing from 3 to 4 ft. of good milling ore. A good deal of water has been encountered, but the pumping out of the old shaft is proceeding satisfactorily.—The shaft of the Savori mine, near the North Star, will be sunk another 100 feet. The vein as exposed thus far averages 18 in. wide.—Reports have it that work will soon be resumed in the Melones mine, at Robinson's ferry on the Stanislaus river. The mine has been closed for several months because a long portion of the flume was washed away.—Twenty stamps are dropping at the Jumper mill.—Neil Cochrane has attached the Nonpareil mine, at Big Oak Flat, for \$1,000 for professional

services rendered.—G. G. Gates is building 20 of his new concentrators in Oakland for the Eagle-Shawmut M. Co.—It is stated that Nevada capitalists have taken over the Black Oak mine, and will work it on a large scale after unwatering it.

COLORADO.

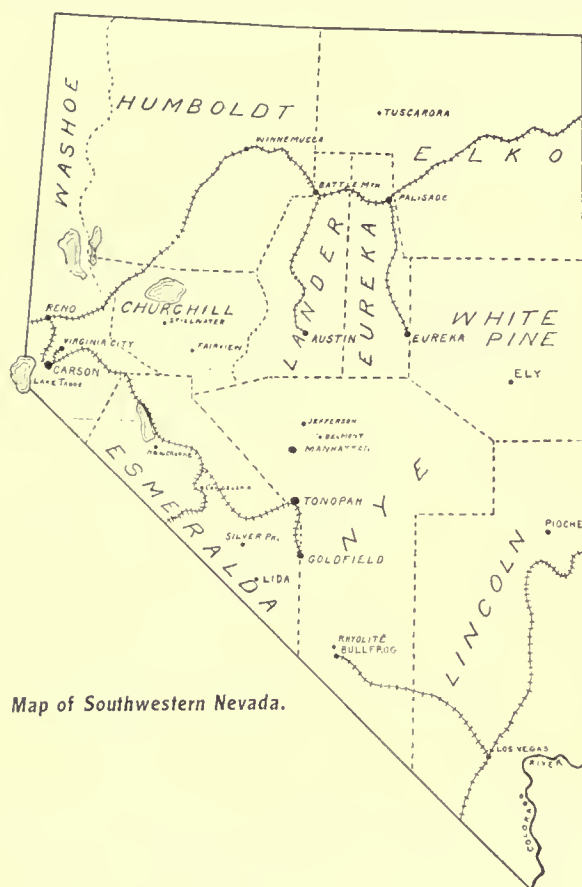
TELLER COUNTY.

With dividend payments running all the way from \$3,000 to \$120,000 by leading mines within a few days' time, and a monthly production of over a million dollars, there is no discussion here as to whether mining should be classed among the gainful occupations. The mines of Bull hill continue to hold the record for production. The recent strike of the Isabella at the 1,000-ft. level is still the talk of the camp. The Delmonico, a portion of the old Stratton estate, is being vigorously developed by its new owners, the Consolidated Copper Creek Co., whose shaft is going down rapidly.

NEVADA.

ESMERALDA COUNTY.

The production of the Goldfield mines amounted to 3,417 tons with an estimated value of over \$350,000 for the week



Map of Southwestern Nevada.

ending August 23. This total is low on account of the shut-down at the Mohawk, since Sunday, the eighteenth, owing to the walkout of the miners, and the closing of the Combination since the twenty-first, from a similar cause.—For the week, the Nevada Goldfield Reduction Works received consignments of ore as follows: Little Florence, 425 tons; Mohawk, 240; Mowhawk Combination, 700; Higginson, 106; McNaughton, 41; Red Top, 435; Frances Mohawk, 15; Hayes-Monette, 125; Rogers Syndicate, 90; Total, 2,177 tons. Total mill value about \$272,125. For the same week the Western Ore Purchasing Co. received consignments of ore as follows: Mohawk Jumbo, 603 tons; Mohawk Ledge, 92; Florence Leasing Mining, 12; Mohawk, 43. Total, 750 tons. Average value about \$93,750.—The old trouble about change-rooms is again up between the miners and operators. The union miners repudiated their agreement with the Consolidated officials, and walked out at the Mohawk and Combination mines. Their chief contention seems to be that they must be watched over in the change-rooms only by members of the Western Federation of Miners, and a general strike may follow, resulting in Goldfield being an open camp.

WASHINGTON.

FERRY COUNTY.

(Special Correspondence).—The Winnipeg Mining Co. was organized April 1, 1905, and capitalized at \$1,500,000. The directors are C. W. Clark and Arch. Wright, of Winnipeg, and E. R. Fraser, W. R. McCracken, and Charles Garber, of Spokane. Joseph L. Lancaster is the superintendent. The company owns the Hawkeye, Laughing Water, Governor Rodgers, Struck Luck, St. Barnard, Eagle, Waterloo, and Hawkeye No. 3 claims in one group, on Lambert creek. The property was recently equipped with a Leyner straight line eight-drill compressor, and an Atlas 100-hp. tubular boiler. An Ingersoll-Rand drill is in commission, and two more have been ordered. This may develop into one of the most valuable mines in Ferry county. An incline shaft has been sunk 240 ft. on the foot-wall of the vein, a horse-whim and gasoline engine having been used for hoisting purposes. An adit is in 1,070 ft., and connected with the workings from the shaft. It passes 210 ft. through glacial drift, 600 ft. through decomposed granite, over 200 ft. through altered syenite and into an immense vein of iron sulphide ore, with gold, silver, and copper. The formations intersected are intercalated with narrow beds of limestone. Three stringers of ore, from 6 to 18 in. wide, with rich streaks of chalcopryite, are bedded in the granite, in low-grade quartz. The main vein has an approximate width of 70 ft. on this level and was first encountered in the adit on the hanging-wall side. No drifts have yet been driven on either the hanging wall or foot-wall by which any information can be had on the length of the orebody. The shaft is in ore from the collar to a depth of 115 ft., on a 56° pitch of the vein. It then goes down successively through 10 ft. of porphyry, 20 ft. of syenite, 15 ft. of porphyry, and 70 ft. of ore. A sump follows the foot-wall an additional depth of 12 ft. in ore. The strike of the vein is N 30° E, the pitch is N 60° W, at an angle of 56°. A drift has been driven 65 ft. through ore on an intermediate level, at a depth of 80 ft. Another level has been opened from the shaft at a depth of 140 ft., where the width of the pay-shoot is about the same as in the adit level. On both of those levels stations are being cut, preparatory to stoping. A station is being cut on the adit level. Taken from the surface to the lowest level, limonite, hematite, siderite, magnetite, pyrite, marcasite, pyrrhotite, and arsenopyrite are found in the ore. A force of 18 men is employed by the company. The distance from the portal of the adit to the ore-bins of the Belcher Mtn. railway siding is less than 80 ft. The stockholders of the Winnipeg Mining and Belcher Mtn. railway companies are almost identical, which will insure the lowest rates for transportation from the mine to the main lines in transit to the smelters. Work on the Belcher mine will shortly be resumed, with new plans, under new management. The Bortle tunnel is in 77 ft. and is being driven under contract, with three shifts of four men each.—The cross-cut from the No. 2 adit on the Copper Key mine has cut the orebody for 71 ft., and there is no sign of the hanging wall.—On the Oversight group a new tunnel has been started to tap the Pin Money vein at 12 ft. lower elevation than the bottom of the shaft, for the purpose of driving on the vein and stoping. It will have 80 ft. in all to run. The open-cut has crossed another vein, eight feet in width, with rich ore on the hanging wall identical in appearance with that of the Pin Money vein.—In the Iron Chief, a vein of iron sulphide ore has been followed for 160 ft. by an adit and about 150 ft. by drifts. A new tunnel was driven 75 ft., and ore of a similar character was encountered. It is all of shipping grade, although the vein is narrow as compared with most others in the neighborhood, and is believed to be a stringer from the main vein.

Republic, Aug. 28.

STEVENS COUNTY.

(Special Correspondence).—Work has been resumed on the Populist group, on Jumbo Mtn., and the property is looking well, with some good ore in sight.—Seven miners are employed on the Chief & Butte mine, on Pierre creek, a controlling interest in which is under bond to the Green-

ough brothers. The property is looking so well that there seems no doubt that the bond will be taken up.—The Hibernia Mining Co. is applying for a U. S. patent on the Abe Lincoln and Bryan claims. From the bottom of a shaft on the former, 108 ft. deep, a body of ore 40 ft. wide, averaging \$9 per ton, has been intersected. It is proposed to extend an adit from the Viking ground, adjoining to cross-cut the vein on the Abe Lincoln claim at a depth of about 1,000 ft.—The Viking Copper M. Co. owns the Minnie Healy, St. Lawrence, and Mountain Consolidated claims, west of the Hibernia Co.'s ground, on the east side of Kettle river, near Rock Cut. Considerable work has been done on the claims, and good ore has been uncovered on different veins, samples from which have assayed as high as \$90 per ton in gold and copper. The ore on the most extensive showing averages about \$14 per ton. The adit to be extended into the Hibernia ground will tap the Viking's main vein at an approximate depth of 900 ft. The property is handy to transportation, being on one side of the Kettle river, and the Washington & Great Northern railway is on the other. A good bridge spans the river.—A drift is being driven on a vein, from two to three feet wide in the Globe mine. A good wagon-road will be built to the mine, and the former will afterward be equipped with machinery, and the company will then begin shipping ore. The mine is three miles distant from Orient, the nearest railway shipping point.

Republic, Aug. 26.

BRITISH COLUMBIA.

The inability of the Crow's Nest Pass collieries and coke plants to furnish an adequate supply of fuel to the Boundary and Rossland smelters, has caused a decided shortage in the output of those districts during the week ending August 17. The Rossland mines shipped and crushed ore as follows: Centre Star, 2,330 tons; Le Roi No. 2, 315 tons shipped and 700 tons milled; and the White Bear, 175 tons shipped and 350 tons milled. Total, 3,770 tons of ore treated.—The 12-drill compressor of the Iron Mask has been shipped to Phoenix to be used at the War Eagle group, which has recently been purchased by the Consolidated company. The Idaho shaft is down 40 ft. in pay-ore all the way, and on the Centre Star 1,100 level driving continues on the vein, which is six feet wide.—No ore was shipped from Le Roi, as there is not enough coke at Northport, and the smelter there is closed. Diamond-drilling continues on the Spitzee.—S. E. Griswold, manager of the Inland Empire, states that the hoist and pump will be running in a few days, when development at depth will be commenced.

The Trail smelter feels the coke shortage, and only half of the furnaces have been in operation. In addition to Rossland consignments, shipments were received during the week as follows: St. Eugene, Moyie, 535 tons; Whitewater, Alnsworth, 122; La Plata, Kokanee creek, 56; Standard, Silverton, 24; Westmount, New Denver, 23; Canadian group, Sandon, 22; Arlington, Erie, 22; Lorna Doone, Silverton, 22; Queen, Salmo, 22; Dunean, west fork of Kettle river, 17; Providence, Greenwood, 15, and Enterprise, 5 tons of ore.—The Northport smelter is being overhauled during the shut-down, and no ore was received during the week.—The Boundary mines shipped ore as follows: To Granby smelter from Granby mine, 16,773 tons. To B. C. Copper Co.'s smelter from Mother Lode, 5,977; from Snowshoe, 1,755 tons. To Dominion Copper Co.'s smelter from Brooklyn, 704; from Idaho, 1,280; from Rawhide, 2,940; from Sunset, 1,645; from Mountain Rose, 80 tons. To Trail smelter from Snowshoe, 1,655 tons. Total shipments for week, 32,809 tons, and for year to date, 744,151 tons.—Boundary smelters this week treated ore as follows: Granby smelter, 15,473; B. C. Copper Co.'s smelter, 9,471; Dominion Copper Co.'s smelter, 6,649 tons. Total treatment for week, 31,593 tons, and for year to date, 729,386 tons of ore.

The difficulty of getting coke is giving rise to a good deal of discussion in this district. The trouble seems to be largely due to the shortage of men at the collieries and coke ovens. Wages have risen in the metal mines, lumber camps, and harvest fields until they are higher than those paid for unskilled labor at Crow's Nest Pass, resulting in a

shortage of men there. Another cause is the shipping of coke to Montana for the smelters in that State. The managers of the local smelters consider that the home plants should be supplied first, and only the surplus shipped abroad.

MEXICO.

CHIHUAHUA.

The new 100-ton dry concentrating plant using the Sutton-Steele pneumatic process, is working at the Calera zinc mines, near Miñaca. C. M. Pringle is the general manager.—Manuel Gameros has purchased more silver-lead claims in the new Cerro Colorado district.—The output of the Dolores mines at San Isidro for July was \$90,000. W. H. Paul has succeeded in increasing the production since he took charge of the properties.—Some rich copper-silver ore has been struck about four hours' ride west of Chinipas, in the western part of the State. A shaft is down 150 ft. and work is progressing under the charge of E. A. Merriam.—A shipment of 300 cut turquoises was recently made from Chihuahua, the stones coming from the O. K. mine at Hornigas, near the K. C. M. & O. railroad. R. H. De Berque owns the property.—An order was recently received by all agents along the Mexican Central line, to the effect that no more zinc ore shipments for the United States were to be received, until further orders. This has caused great disquietude among the zinc producers, as their market is cut off.—The railroad from Baca station on the Parral branch of the M. C. to the Cigarrero mine is completed.—The Resolana Mining Co. will build a 50-ton mill on its property, three miles from Santa Barbara. Peter Lee is president of the company and Luis Joseph treasurer.—It is rumored that the Montezuma Lead Co. may start up its concentrator at Santa Barbara in the near future. Several of the shareholders of the San Diego M. Co. have recently come from New York and Missouri to see the property. The deepest shaft is down 260 ft. A new gas-producer power-plant will be built. Nat P. Wilson is superintendent for the company.—After a long period of experimentation the concentrating plant of the Minas Tecolotes y Anexas, at Santa Barbara, is running steadily, and treated 13,600 tons of ore last month. About 800 men are employed.—The pumps in the Americana mine at Terrazas are raising 2,500 gal. water per min., and the water in the cave is being rapidly lowered.

By the execution of a judgment recently passed by the Supreme Court, the Don Jose Mining Co. is given possession of the mines at Gavalana. This is the first time for 27 years that all litigation has been cleared up, and the history of the mine is one long story of legal tangles, adverses, and difficulties.

GUERRERO.

The Mitchell Mining Co. is in receipt of wire advising it that the steamer bringing the rails for the La Ocha & Pacific railroad connecting its mines in Guerrero with the Pacific coast has arrived at Acapulco from Antwerp, and that the unloading at Port Marques was begun at once.

JALISCO.

Patrick Fitzgerald has been appointed general manager of the Santo Domingo mines in the Hostotipaquillo district, to succeed T. Elliott Smith, who resigned because of ill health. Nathan Udell is assayer for the company.—William Oliver, for several years general manager of the Agua Blanca mine of the Mexican I. & D. Co., in the Autlán district, has retired, becoming consulting engineer for the same company. Michael Minnehan succeeds him. The work of remodeling and enlarging the Agua Blanca concentrating plant is nearly finished. The concentrate will be freighted by wagons to Ameca.—Although the rainy season is on, in Autlán copper prospecting continues, especially in the Ayutla and Coapaxtle hills; in the latter, Emilio Leonarz, representing a German company, is developing the Princesa mine by a tunnel.—Thomas Kelly of Chicago has taken up a number of claims in the Ojo Verde district, through his representative, Frederick Ossolinski. If the Jalisco railway is extended as proposed, it will open up a promising copper country.

Special Correspondence.

Denver, Colorado.

The Card System at Telluride and Cripple Creek.—Labor Conditions.—Political Conditions.—Copper Ores in Colorado.

The announcement that the Smuggler-Union will abandon the card system, following, as it does, its abandonment by the Liberty Bell and the taking on of union miners by the latter company, has caused a buzz of comment in Telluride and throughout Colorado. The cause of the move is the present great difficulty in securing enough men. For a long time it has been difficult to obtain competent men; more lately it has been equally difficult to obtain any men at all. Most of the companies in Telluride have not, for this reason, lived up very strictly to the card system, so that the present move is more in the nature of a formal abandonment. Bulkley Wells announces that no union men will be employed, but, if, on the termination of the leases by which that property is now worked, the workings are again opened on company account, as is the general belief, it may prove difficult to adhere to this ruling.

In Cripple Creek, on the other hand, the card system is to be rigidly maintained and new notices to that effect are being posted throughout the district. Since the loss of the cyanide plant of the Golden Cycle Co. by fire, several properties that produce low-grade ores and enjoyed extremely low treatment rates at the Golden Cycle mill, have chosen to shut down until such time as the plant can be rebuilt rather than attempt to operate at smelter rates. This has given a temporary over-supply of labor in the district and the Mine Owners Association will probably find it easy to maintain its exclusion of members of the Western Federation of Miners, for some time at least.

A most promising property at Telluride is that of the Black Bear Co. This company is operating on what is regarded as an extension of the same vein that the Tomboy Gold Mines, Ltd., is exploiting and the showing so far made is highly encouraging. The workings are situated near the head of the cascade in Ingraham gulch, a wire-rope tramway to a point a little east of the Smuggler-Union mill serving for transport to the railroad level.

The political situation in the State does not at present offer much of interest, the guerrilla warfare which Judge Lindsay is waging against Governor Buchtel and the large corporate interests of the State figures most largely in the public attention. The Governor seems to find himself generally helpless to turn the tables upon his nimble adversary. Whether the statements made by the Judge are entirely true, there is certainly truth enough in them to call for some serious thought upon the part of all who believe in more than a merely republican form of government. With the coming of Utopia it may be possible to have a cleric and educator elected to the position of chief executive of the State, simply out of respect for the clerical and academic atmosphere and influence, but it seems scarcely possible that we have arrived that far yet. Those who object to being governed by, and in the interests of, corporate wealth, do not hesitate to deny that we have progressed so far. Be that as it may, Judge Lindsay has shown himself a sincere friend of, and unselfish worker for, the good of the raw material from which the commonwealth continually rebuilds itself, the boys and girls of the State. It is to be hoped that his influence, in this regard, at least, may never grow less.

The comparative slight importance of copper ore and copper smelting in Colorado must always be a source of

surprise when one regards their great importance in the States south, west, and north in the Cordilleras. In Colorado they are developed to so slight a degree that where copper ore is found, it must usually be shipped long distances for treatment, and this lack of smelting facilities has handicapped the development of many properties that might otherwise be paying mines. Possibly the development of the mineral resources of Routt county may aid in remedying this defect. Ex-governor Routt, for whom Routt county was named, and who was the first governor of the State of Colorado, was buried with State and municipal honors from the capitol on August 16, adding another to the list of pioneers who have gone to their long home. The romance of mining has largely fled; soon there will be none left to tell the tale of the early days to a more prosaic generation.

Butte, Montana.

Effect of Lower Price for Copper.—Lessening Production.—The Amalgamated Mines.—Butte Coalition.—Big Lode in the Rarus.—New Machinery.—The Snowstorm.

The falling price of copper will soon have an appreciable effect on the mining industry of Butte, for a low price of the metal will force many lessees and small mining companies to stop operations. Already the Bullwhacker company has ceased mining, because its ore, which averages only about 4% copper, is not rich enough to pay a profit at present prices. The smelters are also declining to purchase the lower-grade ores because of the uncertainty of the copper market. There also appears a tendency on the part of the large companies to curtail the copper output, and it would not be surprising if some of the large mines were closed and kept shut-down until the surplus copper is absorbed and there is a better tone in the copper market. The Never Sweat mine of the Anaconda Co. and the West Colusa mine of the Boston & Montana Co. have already been shut-down, though other causes than those indicated are given for this step. The prevalence of gas from a mysterious fire is given as the reason for the West Colusa suspension, and the machinists' strike is credited with the closing of the Never Sweat, the big engine at that mine being out of repair. It is surmised, however, that these apparent reasons are welcomed as an excuse for closing some of the mines. It is announced that as other engines break down, other mines will be closed. All labor about the mines and all kinds of supplies are costing more than they have in many years and it is apparent that the mining companies could make money by leaving the ore in the ground instead of storing copper on the surface. Labor conditions are not at all satisfactory in Butte, due to the strike of machinists and the action of the Western Federation of Miners in declaring void the contracts entered into by the miners and companies of Butte for a term of five years, by which the miners agreed to accept a sliding scale of wages, working for \$4 per day of eight hours while copper is at 18 cents or more per pound, and to return to the old wage of \$3.50 per day should copper prices drop below 18 cents. There seems to be a general impression that the miners will refuse to accept a reduction, notwithstanding their contracts, though the question has not yet been brought to an issue.

John Gillie, general manager of the Amalgamated properties, says that the Butte production of copper is about normal and the Amalgamated is working about the same number of men that it did last year. A great many more men are employed in the district, however, by the new companies. The latter cannot be expected to do much in the way of copper production for several

years yet, and in the meantime the demand for the metal is increasing. "I regard the present drop in price as temporary," said Mr. Gillie. "The big consumers of copper have refused to come into the market and are using up their regular stock. The reason for the drop in price is therefore apparent. But consider what the result will be when these concerns are again forced into the market. I believe we shall see copper soaring again shortly."

The North Butte Mining Co. is driving on the Edith May vein at the 1,800-ft. level and is cross-cutting for the Jessie at the same depth. The cross-cut north from the 1,600 is expected to reach the Berlin vein in a short time. No work is being done on the Berlin shaft. The North Butte continues to mine about 1,250 tons of ore per day, but it is probable that if the price of copper continues low that fewer tons of ore, but of a higher grade, will be mined by the company.—The Butte Coalition output runs between 1,300 and 1,400 tons per day. There is a rumor out that the company will soon begin active operations on the Alice group of mines, in which it owns a controlling interest. It is also reported that a big copper vein has been cut in the Magna Charta, one of the

station will be cut and an electric pump installed. The pump will throw 400 gal. per min. 1,000 ft. Some time ago the company experienced a great deal of trouble from the water, but it is now fully equipped for handling it.

Thomas L. Greenough, president of the Snowstorm Mining Co., says that the mill is handling 4,000 tons of ore per month. The mine is producing as much as can be treated at this time. Two hundred men are working in the mine. A new adit is being driven 500 ft. below No. 3, so as to give an additional depth of 500 ft. on the vein. It will be fully three months before the vein is reached by the new adit. The Snowstorm paid its last monthly dividend of \$40,000 on August 10.

Toronto, Canada.

Gold Finds.—Discovery on Montreal River.—Strike Situation Improving at Cobalt.—News of Operations.—Ore Shipments.—Another Smelter.

A rich gold find is reported near Night Hawk lake, situated west and slightly south of Lake Abitibi. Two Swedes are said to have discovered a vein of gold-bearing rock, 130 ft. wide, and to have traced it for two miles. There is a rush of prospectors from the neighboring settlements and camps. McDougall's Chute, 18 miles distant, has been deserted for the new field. While the first reports as to the extent and richness of the deposit are probably exaggerated, there is no doubt of the fact that gold has been found there. Samples of the ore have been forwarded to the Ontario Bureau of Mines, which show a quantity of visible free gold. The Bureau has also received official information as to the finding of gold at the headwaters of the Black river, a tributary of the Abitibi river. Willet G. Miller, Provincial Geologist, now in the northern region, will inspect these deposits shortly.

Another important gold discovery has been made some 80 miles up the Montreal river from Latchford, and near Fort Matachewan, a Hudson Bay port, on what is known as the South Bend of the river. W. H. Fletcher of Cobalt and Joseph L. Garvin of Ottawa, who have been prospecting there for some time, have discovered numerous large quartz veins, showing free-milling gold on the surface, and the party has staked out 15 claims. The value of the discovery is confirmed by J. T. Carmody of Cobalt, who has a wide experience in Arizona and South Africa, who has just inspected and reported on these locations. One of the veins when stripped measured 35 ft. in width and others from 4 to 8 feet.

Activity is gradually being resumed at Cobalt as the strike situation becomes less serious. The Western Federation of Miners is fighting the injunction lately secured by the Buffalo Mines Ltd. in the courts, and meanwhile the number out of employment becomes continually less, some returning to work on the employers' terms and others on the union scale. The Silver Leaf has accepted the union scale and resumed work. The Tretheway is taking out much first-class ore, a shipment of 20 tons to the Copper Cliff smelter having yielded \$29,000. They have also some 7,000 tons of low-grade ore on the dump.—The Kerr Lake (Jacobs) has started operations with a new air-compressor and drills, and bids fair to be a steady shipper. The Coniagas has secured nearly its full force and it is expected that the new concentrator will be working in a month.—Some good finds have been made at the O'Brien. A newly discovered vein has been stripped for 60 ft. and three small rich stringers, carrying ore as high as 1,000 oz. silver per ton, found running through wallrock, which is shot with silver to the width of three feet. Three other veins have been found, one very rich. There are 150 men at work.—At the Gillies



Montana.

Alice group, by a cross-cut from the Drummond claim.—Little work is being done on the Ophir mine by the Butte Central & Boston Co. and the output by lessees has been reduced lately. It had been the intention of the company to sink a deep shaft on the Ophir, but work on the shaft was stopped after it had been enlarged from a two to a three-compartment shaft some months ago.

One of the big veins of the Rarus mine, owned by the Coalition Co., has been opened at a depth of 1,800 ft., and will soon be in shape for an increased production. The vein was opened by a cross-cut driven 200 ft. from the shaft.—The shaft of the Alex Scott mine is now 1,000 ft. deep. Sinking was stopped several weeks ago and the efforts of the company were directed to exploratory work on the 600, 800, and 900-ft. levels in the hope of striking a good orebody and taking out enough ore to make up a portion of the sum due on the bond. However, no big body of ore was found, and the promoters of the company had to do some remarkable hustling to raise the money with which to pay off the bond, succeeding in doing so just an hour before the expiration of the time. The limited quantity of ore, that has so far been found as yet, has been in pockets.—The new air-compressor purchased by the Colusa-Leonard Extension Co. has been installed and is at work. The shaft has reached a depth of nearly 800 ft. At the latter point a

Limit, the mine of the Ontario Government, the shaft is down 115 ft. and driving to the extent of 210 ft. has been done at the 65-ft. level.—Steady progress in development is being made at the Cobalt Lake mine. The north shaft is down 12 ft. The level station in shaft No. 4 has been blasted out and sinking continued to 92 ft. A level station has been dug out at shaft No. 5 at a depth of 95 ft. and driving begun.—Several new companies, of which little has hitherto been heard, have been doing extensive development work and promise to figure shortly on the list of shipping mines. Among them are the Stratheona, on which some recent strikes promise well, and the American Silver King, where a vein from 3 to 5 ft. wide has been stripped for 200 ft., assays varying from 900 to 1,200 oz. silver per ton.

Shipments of ore from Cobalt for the week ending August 17 amounted to 259 tons, contributed by the following mines: Buffalo, 30 tons; La Rose, 21; Nipissing, 148; Temiskaming, 59 tons of ore.

Considerable excitement has been occasioned during the last few days by an apparently well authenticated statement that the Salt Lake Smelting & Refining Co. intends to erect a large smelter at North Cobalt to cost at least \$2,000,000 with a capacity of 250 tons per day. Charles H. Gage, chief consulting engineer of the Salt Lake Co., was looking over the ground this week.

Mexico City.

Effect of the Railroad Merger.—Car Shortage.—Big Raise in Freight Rates.—Serious Blow to Mining Industry.—Figures that Tell the Story.

Is the great merger of the main lines of Mexico into one large company to be controlled by the Federal Government going to be as great a benefit to the country at large as was promised? Or is it going to be run by other monopolies and take advantage of the general public by reason of there being no competition? And is the guaranteed interest on the bonds to be paid by a general raise on all freight rates? These are the questions that are being asked throughout the Republic of Mexico today, by reason of a general revision of the freight rates on all the lines that are included in the consolidation. The first move was an order increasing the minimum weight for a carload from 10,000 kg. (or 22,000 lb.) to 15,000 kg. (or 33,000 lb.). It was claimed that this was made necessary by reason of the great call for cars and the requirement that they be loaded nearer to their capacities. Be that as it may, it will certainly work considerable hardship on the shipper, who formerly got carload rates on 10,000-kg. loads, but will now have to pay local rates because of his not having the requisite 15,000 kg., and had the railroads any kind of management there would not be such a scarcity of cars. I know of one case of a shipper asking for a week for his goods only to be told by the agent that they had not arrived until finally he learned that the car had been in the railroad yards all the time, and of another case of a car being switched around wild to various concerns for a month before the correct person found his car, although said car was plainly and properly billed.

This increase, however, in the minimum carload weights will not work a material hardship on the miner in general, for his shipments will usually exceed 15,000 kg., but the blow that strikes at the very heart of the mining interest is the new tariff rates on ore, as given out by the railroads mentioned, the principal of which are the Mexican National and Mexican Central railroads, and which rates have been presented to the Federal Tariff Commission

for consideration and approval. The increase in these rates over the old is tremendous and unprecedented, and though they have not as yet been approved, the railroads are urging their approval with all possible insistence, and it behooves all who are interested in the mining business in Mexico to use their utmost effort and influence to prevent the adoption of such rates. In the first place the shipper is no longer allowed to run his own risk of loss and put a valuation of P25 per ton on his ore, but the new rates require an actual valuation according to smelter returns, without freight reduction, and according to this valuation he is given three classifications; the first class being ore worth over P50 per metric ton; the second class, ore of a value between P50 and P25 per metric ton; and the third class, the ore under a P25 valuation.

Formerly practically everything was shipped at P25 release valuation, the shipper being willing to take the risk, but that is to be no longer allowed under the new rates, and the ores of higher value must pay more. Yet does it cost more to haul them?

Space, of course, will not permit of a complete tabulation of the new rates, but an idea of the change made may be obtained by giving a few examples from some of the principal shipping points to the Aguascalientes plant of the American Smelting & Refining Co. and the Torreon plant of the Torreon Metallurgical Co., as follows: From Pachuca to Aguascalientes, a distance of 576 km., old rates in pesos, 5.12; new rates, 3d class, 5.97; 2d class, 7.44; 1st class, 9.36. Pachuca to Torreon, 1,127 km., old rates, 7.58; new rates, 3d class, 7.96; 2d class, 10.05; 1st class, 12.82. From Marfil (the Guanajuato shipping point) to Aguascalientes, 221 km., old rates, 2.75; new rates, 3d class, 3.80; 2d class, 4.59; 1st class, 5.67. Marfil to Torreon, 772 km., old rates, 6.20; new rates, 3d class, 6.83; 2d class, 8.53; 1st class, 10.88. From Parral to Aguascalientes, 879 km., old rates, 8.54; new rates, 9.60, 11.38, and 13.68, according to class. Parral to Torreon, 328 km., old rates, 5.12; new rates, 6.63, 7.46, and 8.71 according to class. While from Chihuahua, whence ore is shipped to Aguascalientes, Torreon, Monterrey, and El Paso, the changes are as follows: To Aguascalientes, old rates, in pesos, 7.17; new rates, 7.70, 9.63, and 12.36; to Torreon, old rates, 4.51; new rates, 5.47, 6.76, and 8.48; to El Paso, old rates, 3.74; new rates, 4.81, 5.88, and 7.38; to Monterrey, old rates, 6.51; new rates, 8.47, 3.76, and 10.48 for 3d, 2d, and 1st classes respectively. It will be seen from the above that these increases run from about 10 or 15% as a minimum to over 100% (see Marfil to Aguascalientes, 1st class) and it is estimated that the increase in freights on ores, based on shipments to smelters during the last twelve months, will be close to 50%, or between 3,000,000 and 4,000,000 pesos in a single year, which the mines will have to stand for the benefit of the railroad. Some of the large shippers will have their freight bills increased by over P1,000 per day. It will react greatly and seriously upon the mining industry throughout the Republic, many properties may have to close down, a great deal of low-grade ore will be cut off, and the chances are that what the railroads hope to gain in rates they will lose in tonnage. This has really been sprung on the public so suddenly (and is not generally known even now) that time has not been given for concerted action among the mining companies, but it is to be hoped that important shippers will take some strong and immediate individual action. The President of the Tariff Commission, who has the same under consideration, is Lic. Don Luis Mendez, First Calle de Damas No. 1, Mexico City. No one who has any influence to prevent the approval of these new rates should fail to use it.

London.

Our Correspondent Waxes Poetic.—Processes and the Zinc Corporation.—West African Output.—Mexican Coal Enterprise.—Cornish Tin Ticketing.—Methods of Ore Treatment.—A Touch of Humor.—Depreciation in Mining Shares.

"Welcome, welcome with one voice;
In your welfare we rejoice,
Sons and brothers, that have sent,
From isle and cape and continent,
Produce of your field and flood,
Mount and mine, and primal wood,
Works of subtle brain and hand,
And splendors of the Morning Land
Gifts from every British zone!
Britons hold your own!"

Thus sang the immortal Tennyson in the ode composed by him for the ceremony at the opening of the Colonial Exhibition at South Kensington by her late majesty the Queen. To your correspondent—still conscious after the lapse of twenty-one years of the thrill of that memorable scene when he assisted in making vocal those stirring words—the indictment against "old John Bull," anent the Royal School of Mines, from "That young eagle of the West" (the ode again!) comes with something like a shock. From the standpoint of the good old crusted heroes and the somnolent South Kensington notabilities of mid-Victorian lustre (on the governing body of the new College), the views expressed in the *MINING AND SCIENTIFIC PRESS* of July 27 must seem rank heresy. None the less they are undoubtedly shared by many people on this side whose opinion is of consequence.

It seems after all that the Cattermole process is not to be the salvation of the Zinc Corporation, but the Elmore oil process. At the recent meeting of stockholders in London, Mr. H. C. Hoover explained that when he arrived at Broken Hill last March it became very evident that the only reliable flotative agent was a mixture of acid and oil. Mr. Queneau's process was acid pure and simple. They then had in front of them two methods—one was the Cattermole process and the other was a machine invented by Messrs. Elmore, which had been largely used in copper mining, but had not been tried on a practical scale in the case of zinc. The plant was altered to adopt that, and at the same time a unit of the Elmore machine was obtained to see if that would give better results. Mr. Hoover said the Cattermole process has not been a commercial success so far, but that is more a question of the quality of the tailing which is available for the present plant than it is of the process itself. If they had available for this old plant (Mr. Queneau's plant) the richer tailing, such as is being treated by the Sulphide Corporation, they too would be earning profits today by that process. Unfortunately the tailing at the British mine is of lower grade. They were anxious to work out their process on the lowest grade position. The Cattermole and the Elmore are not separate processes. So far as the Zinc Corporation Co.'s position goes, the processes are identical. The only difference between them is the different manner in which the concentrate is trapped after being floated. Messrs. Elmore, working largely on copper, have invented a machine that appears to be the solution of the difficulty.

The Elmore results obtained had been very good, and if these results are applied to the Zinc Corporation's tailing, they will be making a profit of from 8 to 10s. per ton. Between 800,000 and 1,000,000 tons of tailing were already paid for and they had available under the options somewhere between 3,000,000 and 1,000,000 tons more. This tailing contains an average of about £5 per ton of gross value in the shape of metal, and there was an enor-

mous margin between that and the present working costs, which are practically £4 12s. 0d. out of the £5. The resolutions for the reconstitution of the capital were carried by a large majority. The 500,000 old shares will be called Ordinary and there is to be an issue of 180,000 Preference Shares. The £1 Ordinary Share has gone down to the "nimble bob," but is now rather better, and a more hopeful feeling prevails as to the ultimate success of the Corporation.

The West African gold output returns for last month were 22,498 oz., as compared with 16,070 oz. for July of last year, an increase of 6,428 oz., while the output for the first seven months of the year is 166,582 oz., or 46,741 oz. ahead of the figures for the corresponding period of 1906.

The directors of the Mexican Mining & Industrial Corporation (floated in the early summer under the auspices of the Venture Corporation) announce that they have secured an option on the Sabinas colliery situated in the valley of the Sabinas river, in Coahuila, Mexico. The circular states that this option having been secured, they will be enabled to proceed with the flotation of Sabinas toward the end of the autumn of the current year, and the directors anticipate that the operation will be successfully carried through with highly favorable results to the Corporation. It appears that the Sabinas colliery is a going concern with a business earning at present about £5,000 per month with a steadily increasing output amounting at present to 22,000 tons per month, and enormous reserves of coal are said to be already opened up.

A notice has appeared in the press that the Lena Gold-fields will be floated by the Russian Mining Corporation in the autumn. This refers to the property of the Lena Gold Mining Co. of Petersburg in Eastern Siberia, north of Lake Baikal, recently visited by C. M. Rolker. It is understood that Mr. Rolker's report is of a highly satisfactory character.

The first Cornish tin ticketing for August is rather disappointing. A lower average price was realized than for the previous sale, and Dolcoath offered only 65 tons. The home parcels amounted to 200 tons, which fetched £21,020 10s. 0d.—an average of £104 16s. 9d. Thirty-two tons of Swaziland tin totaled a sum of £3,713.

At a friendly meeting of interested parties held lately at North Crofty, Mr. Marcus Rutherford, an American metallurgical chemist, described the system that he has adopted for the treatment of the ores of North Crofty, as follows: Roller-crushing instead of stamps, screening after each machine, and the crushing is done dry. The crushed and sized ore is calcined for elimination of sulphur and arsenic. It then goes to the separating machines where all of the metalliferous values are removed, leaving a final discard of quartz and gangue. This complex concentrate contains iron, copper, tin, and zinc, and is smelted, slagging the iron and producing a bronze containing the tin, copper, and zinc. These ingredients may not be in the required proportions to make the desired alloy. This is rectified by adding whatever there may be lacking; in other words, standardizing the alloy. Recovering all of the metals permits of working an ore that is too low-grade to work for any one metal. Under existing methods the Cornish miner not only loses all of the metals other than the one for which he is dressing, but also loses a good proportion of the particular metal in his attempt to get it pure.

After he has dressed an ore for tin and lost all of his copper and zinc—and part of his tin; and another man dressing for copper has lost all of his tin and zinc and part of his copper, and the man dressing for zinc has done the same, these various pure metals come to the brass or

bronze founder and are mixed again to make brass or bronze. In responding to the toast of 'Success to Cornish Mining' one of the guests told, amid laughter, of his experiences on returning from South Africa. He went to one mine and said to the captain: "Why don't you pull out these old heads and install good Californian stamps?" The answer he got was to the effect that if they crushed the stuff too quickly they would work out the mine in a few years—which wouldn't do! He (the guest) recommended the adoption of the South African miner's attitude: "When a mine was worth working, work her for all she's worth, and when she's good for nothing, scathe her and look for another."

More depreciation of mining stock! The monthly table of comparative values of Australasian mining securities given in the *Australasian World* shows a greater shrinkage in aggregate values than on any previous occasion. A year ago the 34 representative mines included in the table were valued by the market at £32,353,095; but at the mid-August settlement their values had fallen to £28,851,686. Compared with the values at the beginning of the year, when they aggregated £34,625,830, the fall is still more severe; and during the past month alone the depreciation amounts to £1,405,188. Between July 10 and August 12, 21 properties depreciated and six appreciated in value, while seven remained stationary. Among the few increases the largest were Talisman Consolidated (£159,375) and Oroya Brownhill (£112,500). The principal decreases were: Kalgurli, £390,000; Mount Lyell, £325,000; Broken Hill Proprietary, £180,000; British Broken Hill, £131,250; Mount Morgan, £125,000; and Waihi, £93,750.

Salt Lake, Utah.

Dividends.—Consolidation at Mercur.—Heinze at Park City.—Ore Shipments.—Scarcity of Coal.—Shipments From Tintic.

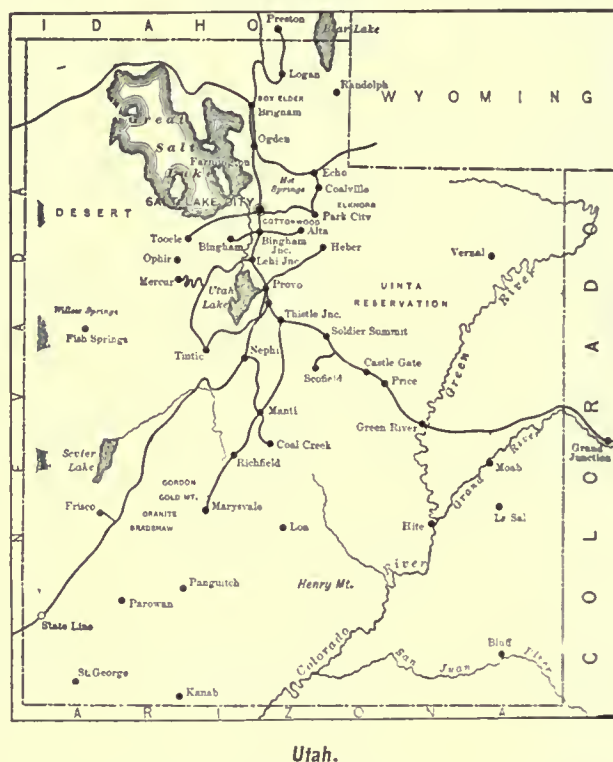
Dividends were paid by Utah mines during August to the amount of \$580,350, the contributing mines and amounts being: Newhouse Mines & Smelters, \$300,000; Colorado, \$120,000; Gemini, \$50,000; Lower Mammoth \$14,500; May Day, \$8,000; Uncle Sam Consolidated, \$10,000; Grand Central, \$12,500; Beck Tunnel Consolidated, \$40,000; Utah, \$3,000; Bingham-New Haven \$22,600.

The Northern Light, Columbia, and Chloride Point mines in the Camp Floyd, or Mercur district, are likely to be consolidated. Special shareholders' meetings of the first two named companies have been called to consider the proposal early next month. It is proposed to take in the Chloride Point by purchase, the price being \$20,000, and form a new organization to be known as the Lion Hill Consolidated Mining Co. The Chloride Point has produced considerable silver ore and has been a dividend-payer.—John Dern, president of the Consolidated Mercur Gold Mines Co., has expressed himself as being eminently pleased with the results achieved by the new slime-plant recently installed at the Mercur mine and states that fully one-half of the loss in the tailing is now being recovered. The last of the equipment has arrived and it is a matter of only a short time until the capacity will be raised to 600 tons daily.

F. Augustus Heinze, who has held an option on a controlling interest in the Silver King Coalition at Park City, has allowed it to lapse. A payment of \$5 per share on a large block of the stock was due on August 15, and on another block on the basis of \$7.50 on October 15. It is believed that negotiations will be re-opened and that the tightness of the Eastern money market has had something to do with the blocking of the deal.

Jesse Knight of Provo has acquired a controlling interest in the Treasure Hill mine at Park City and in compliance with his option has paid \$45,000 into the treasury of the company. Preparations are being made to start vigorous development. A deal is pending for the acquisition of the Creole mine, in which event the Treasure Hill property would be worked through the Creole shaft.—An electric-haulage system is being installed at the Daly-Judge mine at Park City. Recent developments in the mine have been of a very satisfactory character and some recent alterations in the mill have been productive of better results.—The ore shipments from Park City last week amounted to 1,767 tons, the contributing mines and amounts being: Silver King Coalition, 775; Daly-Judge, 293; Little Bell, 49; Daly West, 650 tons.

The Gold Chain Mining Co., with headquarters at Provo, Utah, has filed articles of incorporation to develop and operate the Gold Coin group in the Tintic district.



E. E. Loose, of Provo, is president of the organization. —There appears to be no imminent danger of labor difficulties at Tintic. A statement has been made by the president of the miners' union that the miners are content with the present wage scale.

The fuel situation in Utah at the present time is anything but satisfactory. Mining and smelting companies have found it almost impossible to get coal for storage, and consequently the probability of a famine during the winter appears inevitable. The price of domestic coal in Salt Lake City has advanced from \$5.25, the schedule for lump and nut coal last winter, to \$6 and \$6.50 per ton, and dealers are several weeks behind in their deliveries.

The ore and bullion settlements reported last week in Salt Lake totaled \$724,000, while sales on the Salt Lake Stock & Mining Exchange during the same period amounted to 321,732 shares, for which \$267,884 was paid. —Ore shipments from the Tintic district during the past week aggregated 144 carloads, the contributing mines and amounts being: Ajax, 3; Beck Tunnel Consolidated, 9; Bullion Beck, 3; Colorado, 7; Centennial Eureka, 48; Eagle & Blue Bell, 4; Eureka Hill, 2; Grand Central, 5; Godiva, 2; Lower Mammoth, 2; Mammoth, 14; May Day, 7; Scranton, 6; Uncle Sam Consolidated, 6; Victoria, 3; Yankee Con., 4; other mines, 4 carloads.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

THE electric locomotive has not been much employed in mines in the United Kingdom, but is largely employed both underground and on the surface in America and on the Continent, and in gold mines in New Zealand.

FROM a financial point of view it is essential for profitable hydraulic mining that there should be ample facilities for grade and dump, and a sufficient head and an abundant supply of cheap water; the importance of each of these requirements varies inversely with the richness and extent of the gravel.

THERE are three general forms of water engines: The water wheel proper, such as the overshot or undershot types; the turbine; and the engines typified by the Pelton wheel, which may be considered as between the large water wheel and the turbine. In this classification, the large water wheel and the water turbine correspond roughly to the low-speed and high-speed steam engines.

THE percentage of opening in a screen is the ratio of the net area of the holes to the whole area of the screening surface. This depends upon the arrangement of the holes and the amount of space left between them, and the greater the percentage of opening, the more rapid and perfect will be the screening; but the practical limit is set by the inadvisability of impairing the strength of the screen.

CLASSIFIERS are devices for subjecting sand or slime to the action of water under free settling conditions, with the object either of obtaining a series of products diminishing in size, preparatory to subsequent treatment, or to settle the whole material as completely as possible from the water. They all have a carrying current of water that carries forward whatever grains may remain suspended, and some have rising hydraulic, or clear water currents, added from below.

THE materials used in a structure usually do not conform to our assumption as to the strength and properties of those materials. In many cases the materials, as actually used, are not so strong as we are led to believe by the application of the tests described in certain textbooks. There is no definite value that can be stated as the strength of a particular kind of material without many reservations, and many more reservations than can be conveyed in the ordinary books of reference.

ORE is weighed in tons of 2,000 lb. each in the United States, and bullion is weighed in troy ounces. In assaying, the assay ton system has been generally adopted, based on the proportionate weight of one ounce troy to one ton avoirdupois. By expressing the number of troy ounces in a ton in milligrams we have a weight containing 29,166 milligrams, which is called an assay ton. Therefore, if one assay ton of ore is used in the assay, every milligram of metal extracted from it will represent one ounce troy per ton of 2,000 pounds.

IN Colorado, molybdenite occurs only at or above timber-line, and as a rule disseminated through the country-rock in spots or bands, also in pockets, but seldom in real veins. As the ore is always of low grade and found at high altitudes, concentration is generally best effected at the mine. The concentrate may then be treated chemically and marketed as ammonium molyb-

date or molybdenum dioxide, of a blue color, or as the trioxide. When chemically pure and free from ammonia this sells at \$2 per lb., and metallic molybdenum brings 40c. per grain.

CAST IRON is, generically, iron containing so much carbon or its equivalent that it is not malleable at any temperature. Specifically, cast iron is iron in the form of castings other than pigs, or remelted cast iron suitable for running into such castings, as distinguished from pig iron. For instance, cast iron pigs, or pig iron, is remelted and cast into castings, such as columns, locks, gears, etc., of special shape suited to their special purpose; these are specifically called cast iron, and this is the usual restricted meaning of cast iron in trade language. It has been recommended to draw the line between cast iron and steel at 2.2% carbon for the reason that this appears to be the critical percentage of carbon. In Germany every metallic product of the blast-furnace is called pig iron or cast iron.

SULPHUR deposits of value occur in the State of Louisiana. Great difficulty was at first experienced in dealing with these deposits, which occur at a depth of between 600 ft. and 800 ft. below the surface, by reason of the fact that the over-laying strata contained quicksand. The beds have been ascertained to be between 100 ft. and 200 ft. thick and extend for many miles underground. They are now being mined by means of steam and compressed air. Borings are driven into the stratum of sulphur, and a steam pipe leads down to the bottom of the bore. Steam is then forced down the pipe, and the melted sulphur is brought to the surface by a compressed air lift-pump system. At the surface it is discharged into large concrete-faced shallow vats or pools, where it is allowed to solidify, after which it is broken up and shipped to the refinery or direct to the market.

LIQUID AIR was first used as an explosive only in combination with other substances. It is now used alone, its explosive power depending upon its property of turning suddenly into vapor at an elevated temperature. If the vessel in which the liquid air is contained is sufficiently tight, very high expansive powers are attained. For this reason it is stored in vessels having a small opening. This property of the liquid air makes it necessary to place the cartridge in place in the rock before it is loaded. In English mines the cartridges are made of thick phosphor-bronze, the loading being calculated so that the pressure reaches 5.6 kg. per sq. cm. The explosion takes place in six or eight minutes after loading and about 30 tons of coal are broken by one shot. The coal falls in blocks about 60 cm. in circumference. A heavier loading of the cartridge causes the coal to be broken into powder.

BARYTES occurs commonly in veins as a gangue of metallic ores, and also in veins in sandstone and limestone, or as a replacement of limestone. Differential weathering of the limestone and barytes has given rise to deposits of barytes embedded in residual clay. It thus may have a wide range in geologic age and an extensive distribution. The principal sources, however, are limited to two districts—that of Missouri and the Appalachians. In Missouri the counties of Washington, St. Francois, Crawford, Cole, and Miller are producers, Washington county furnishing three-fourths of the output of the State. The Appalachian district includes contiguous portions of Virginia, Tennessee, and North Carolina. Barytes has been found also in the Cumberland valley in southern Pennsylvania, although but little has been produced there.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

The Royal School of Mines.

The Editor:

Sir—Mr. Garrison's letter protesting against the extinction of the Royal School of Mines, published in your issue of July 27, requires an answer. He is mistaken in assuming that the School is to be abolished because of its affiliation with the newly formed Imperial College of Science and Technology. Under the charter the School maintains its name and its diploma and remains a separate institution, as much as it did when affiliated to the Royal College of Science. The new arrangement has the support of the Institution of Mining & Metallurgy, which includes numbers of old students of the Royal School of Mines among its members; indeed, it is largely due to the efforts of the Institution that the new arrangement, which it is hoped will improve the education given by this famous school, has been brought about.

W. FISCHER WILKINSON.

New York, August 15.

[Mr. Garrison understands the new plan. Like the editor and other graduates he would prefer to have a first class funeral for the old School of Mines than see it made a part of an Imperial scheme with a parochial endowment and a kindergarten annex. The efforts of the Institution are cordially appreciated, but they have been largely neutralized by the inertia of British red tape and the inherited incubus of South Kensington. Incidentally it is amusing to see an editorial article on mining education in the *Mining World*, a Chicago periodical, in the course of which reference is made to "British home and colonial colleges" that are supposed to train mining engineers. Camborne, Ballarat, Johannesburg, and Otago, are mentioned, but the Royal School of Mines gets no recognition. Is it the ignorance of the man at Chicago, or is the R. S. M. no longer worthy of mention?—Editor.]

Erosion and Oxidation in Sonora.

The Editor:

Sir—The suggestive address by H. V. Winchell, printed in your issue of July 13, and the stimulating editorial in the following issue, have led the writer to consider how far some of the theories set forth coincide with his observations.

As the discussion has referred to hot and arid regions, a few words on northern Sonora may be of interest. For several months the writer has been in the southern part of the Magdalena district where mineral veins and ore deposits are very numerous, although there are no deep mines. Here both oxidized ores and sulphides are found at many points. The zone of oxidation in some properties has been opened to a depth of 300 ft. or more, while in others sulphides occur within 20 to 40 ft. of the surface. The conclusion reached by the writer with reference to this variation is that in general erosion keeps pace with oxidation where the surface slopes are abrupt. Where they are gentle, or nearly flat, oxidation is deep. It would not be true, in Sonora, to say that oxidation is more noticeable in advance of erosion on the warmer slopes of the mountains. Here the south and west slopes, which endure the higher temperature by day, are subjected to a greater contrast of low temperature at night and so to greater strains and resultant disintegration.

Without doubt, oxidation must progress more rapidly in Sonora than in a colder region, but with the oxidation of

the sulphides and the alteration of the metalliferous minerals, that of the country rock also occurs and thus aids erosion. Further, the character of the enclosing rock bears an important relation to the progress of oxidation. A hard massive quartz will carry iron pyrite and galena unaltered at the surface, because the quartz is relatively impervious to water. A limestone baked and hardened by volcanic intrusions may also hold galena or pyrite unaltered at the surface. Again, oxidation may be prevented by the retention of the ground water in the rocks through the obstruction of their natural drainage by volcanic dikes.

Since all explanations of natural phenomena become more complex as more facts are recorded, we may expect that a complex explanation will be necessary to state the varying relations of oxidation and erosion. But whatever variations in opinion may come through increase of information, we most fully acknowledge our obligation to the pioneers in thought who supply us with foundation to work on.

F. J. H. MERRILL.

Llano, Sonora, Mexico, August 18.

Concentration of Slime.

The Editor:

Sir—I have been engaged for a number of years in milling, amalgamating, and concentrating California gold ores; and have made a careful study of the losses encountered, and methods for concentrating, and recovering, a part of them on canvas tables and other appliances. Thinking that perhaps a discussion on this topic might be interesting to a part of your readers, I submit the following:

California gold ores are mostly crushed to pass screens having from 20 to 40 openings to the linear inch. They are amalgamated on copper plates, with a subsequent careful concentration on vanners. This latter treatment practically recovers all of the metalliferous particles that would be retained on a sieve having 150 openings per linear inch. In order to make a further concentration of the finer particles, it is necessary to size and eliminate the coarser particles of waste. This is usually effected in a crude way, by passing the tailing through variously, and often wonderfully constructed, apparatus, called hydraulic sizers. In some of the installations that I have seen, the pulp passes through a complex series of these devices and still discharges muddy water with the coarse sand and carries over large particles of waste with the slime for treatment on the canvas plates.

Classification is of prime importance, if a good recovery is to be obtained on canvas; and in my opinion the best cone-sizers to be obtained on the market should be installed, instead of wasting time and money with make-shifts. Now having crudely eliminated the principal part of the waste oversize particles, there is diversity of opinions as to whether the tailing should be still (1) further separated into two or more grades of material, and each different grade given a careful treatment on properly adjusted canvas tables; or (2) whether it should be first treated as it is and then resized and the finer particles given another treatment on a differently adjusted canvas plant. I am an advocate of the second method of treatment; for the reason that fine slime does not greatly interfere with the collection of the coarse particles of mineral; but the coarser particles of waste do interfere seriously with the concentration of the finer particles of mineral.

Various plants with which I am acquainted are only recovering about from 15 to 20% of the mill losses, employing the first method; while I once constructed and

operated a plant on the second plan that effected a recovery of nearly 50% of the mill-losses. In the plant that I installed and operated I first treated the tailing as it came from a 20-stamp mill by a sluice system over cloth of twilled drilling with a distribution of about one foot per stamp, and a flow of 12 ft. This was to collect a part of the oversize particles of mineral that normally should have been saved on the vanners. I then sized out the coarse particles of waste with a crude hydraulic sizer and treated the pulp again on a sluice system with four times the original spread, or width of distribution; after which I sized out practically all of the sand of a size to be retained on a 120-mesh sieve, then treated the pulp on wide tables of the Gates style with six times the original spread, or distribution.

In this case the canvas-concentrate was rich enough for direct chlorination treatment without reeleaning. If it had been necessary to reelean the canvas-sweeps on vanners my percentage of recovery would unquestionably have been lowered. But I claim that it would still have greatly exceeded the recovery usually obtained by the plants that practise classification into a series of different grades and then give each grade a single treatment, for the reason that many of the finer particles of mineral that are associated with the coarse sand are displaced from their lodgment on the canvas by the action of the heavier particles of waste, so as to be carried away and lost. One of the principal arguments advanced by the men who first separate into different grades before canvas treatment, is that it is necessary to have the material separated into grades for reeleaning on vanners because it is necessary to have the vanners adjusted to a different speed and throw for treating different sized particles of mineral. I agree with them thoroughly in this proposition; but why cannot the canvas-concentrate be treated on the vanners in the same way as I advocate for the first treatment on canvas, namely, treat all the pulp on vanners adjusted to save the coarse particles of mineral; then size out, and eliminate, the coarse particles of waste, and then reconcentrate the fine particles on suitably adjusted vanners. Of course the material should be passed through dewatering cones as it is essential for good vanner work on all grades of material, to have the pulp of the right fluid consistence.

Perle T. Hambric, who is at present operating a canvas-plant at the Central Eureka mine, has recently invented and applied for patent on an automatic plant that will probably revolutionize canvas concentration, and lead to its introduction and use in cold countries. This device is designed on the lines of a merry-go-round with the tables constructed in tiers around the periphery. Mr. Hambric says that he can design and construct the plant of structural steel to carry ten decks of canvas tables, one above the other, and in this way erect a plant of a capacity for handling the pulp from a 100-stamp mill, and house it in a building 40 ft. square. The machine is adjusted to revolve slowly around a central axis and at a certain point in the revolution the pulp is cut off and the accumulated concentrate removed, to be saved by means of a system of spray-pipe. The plant is entirely automatic and requires no attention, except to change the canvas every few months and see that the spray-pipes and pulp-distributors do not become clogged so as to interfere with the operation of the plant. Some ores carry quite a lot of valuable mineral that either occurs naturally in a state of slime in the ore, or is ground to so fine a state during the crushing operation that it cannot be collected on an ordinary canvas plant, but will remain in suspension in still water for hours. In some instances this suspended mineral possesses some adhesive quality that causes it to adhere together and accumulate on suit-

able surfaces, if the muddy water from which all of the fine sand has been eliminated is allowed to circulate slowly through a tank or reservoir filled with pieces of lumber, or other collecting surfaces, set at such an angle as to allow the non-adhesive particles of gangue to slide off by reason of their gravity. At one mine I was able to collect a lot of this valuable material by passing the muddy water below the canvas plant through a tank filled with pieces of lumber fixed on an inclination of about 50 or 60°. The fine suspended mineral would collect and build up as a slimy product of about the consistence of vaseline, and assaying \$150 per ton.

It is well known that mineral oils have an affinity, or attraction, for fine gold, and many of its associated minerals. If a fine particle of free gold, amalgam, or mineral carrying gold becomes coated with a film of oil, and does not possess sufficient specific gravity to be concentrated, it will probably float on the water. If the film of oil be thick enough, it will rise and float on the surface; but my observation has been that, while such a tailing always shows slight films of oil that carry small quantities of valuable mineral, the proportion of it is infinitesimal in comparison with the suspended mineral that simply floats on the water.

Allowing that it is oil, the question arises as to the source from which the oil emanates. In my opinion the oil may be derived from the following sources: First, mineral oil used as lubricants on drills, cars, skips, hoisting-cables, rock-breakers; and on the guides and cams around the batteries. Second, vegetable oil derived from crushing chips in the mortar. The latter is the more important.

This floating mineral often comprises over one-half of the mill-loss; and while a part of it can be recovered by proper appliances, I believe that the better plan would be to avoid making the greater part of it, by studying the cause and devising means for milling the ore in such a way as to prevent its formation. In my opinion this could be most readily accomplished by successive crushing followed in both operations by amalgamation and concentration. The wood and oils would be eliminated at the first operation, leaving only the coarse clean particles of ore for the final fine crushing, which I think should probably be effected in a tube-mill.

WILTON E. DARROW.

Sutter Creek, Cal., August 20.

NICKEL IN ALASKA.—At two points on the shores of Prince William sound there has been prospecting for nickel. One occurrence is in small stringers along the south side of Port Valdez, and the other is near the mouth of Miners river, on the east side of Unakwik bay. The country rock is diorite, carrying disseminated pyrrhotite. The vein, if it can be so called, is a zone in the diorite impregnated with this iron sulphide, and has no sharply defined walls. This sulphide-bearing rock is 10 ft. or more wide, and above the tunnel, which is at the water's edge, a zone of iron-stained rock, perhaps 20 ft. wide, can be seen running up the cliff. Here also there are in the diorite some pegmatite veins, which carry pyrrhotite. These veins resemble those north of Mummy bay on Knight island. They are from $\frac{1}{2}$ to 2 in. wide, and are not sharply defined. There are also in the dioritic country rock small fractures filled with quartz, but these do not, at least so far as seen, carry the iron sulphide. It was thought that the pyrrhotite carried considerable nickel, and also cobalt, but selected samples of the best ore which could be found at this point were assayed, and the results showed neither cobalt nor nickel.

Opening of the New Mining Building of the University of California.

On August 23 the Hearst Memorial Building, given to the University of California by Mrs. Phebe Hearst, was opened with appropriate ceremony. These new quarters for the mining department of the University represent a memorial to George Hearst, former senator from California and a mine operator famous in the story of Western development. The money for the building (which has cost thus far \$550,000) is supposed to come from the dividends paid by the Homestake mine, in South Dakota, one of the great ore deposits the exploitation of which was undertaken by James B. Haggin and George Hearst, who were associated in many successful enterprises. Mr. Haggin is still alive, a veteran, but an active figure in the mining world. Another famous mine and the one that laid the foundations of the Hearst fortune was the Ontario, in Utah, which was only a prospect in 1872 when George Hearst examined it, deciding that "the vein had all the marks of a thoroughbred." To make the purchase, he drew on his associates in San Francisco for \$32,500, and it is said that they hesitated, having been unfortunate in some other mining deals, but they finally decided to back the judgment of Hearst—how successfully we all know now, for the Ontario has produced \$36,000,000 and has paid \$15,000,000 in dividends. The new Mining Building is worthy of the Homestake, the Ontario, and other great mines that have paid tribute to the erection of it. It is also worthy of the splendid group of buildings destined to adorn the campus of the University. The material is granite, the fine-grained white variety quarried at Raymond, on the edge of the Yosemite valley. Seen at a distance it looks like marble, but it is more enduring.

Mrs. Hearst was present, also Mr. William R. Hearst, his wife, and their little son. In the gathering, besides the faculty and students, were a number of representative mining engineers, many of them graduates of the University. Mr. Benjamin Ide Wheeler presided, with a tact that was perfect and a manner that gave a quiet dignity to the whole ceremony.

The President, in opening the exercises, spoke extemporaneously as follows:

"Members and Friends of the University of California: This occasion transcends in significance very materially the opening of a single building, for this occasion connects itself closely with the consistent permanent building plan of the University—a plan for buildings of an established standard. We owe the arrangements for that plan to the generosity and forethought of the same woman to whom we owe the building of the structure itself.

"The architectural plan adopted after the acceptance of Bernard's sketches is being adapted to the practical needs of the University by the University architect, John Galen Howard. The plan is there, and it will abide. This building belongs to the plan. California hall belongs to the plan. The Greek theatre, which we owe to another member of the same generous family, belongs in the same plan. The as yet uncompleted president's house and the central heating station, of which I am very proud, belong in the plan. So there are five buildings practically completed that belong in the permanent plan. Then, again, the foundations are being laid for the Doe library. That will be part of the plan. So will the Boalt law building that is soon to be erected.

"The standard of buildings has been fixed, and coming generations will not dare build shabby buildings on this site. We owe that fact to this building and to Cali-

fornia hall, that have set the standard for the future. They are built of honest material, honestly put together, and they tell the world that we feel nothing is too good for the University of California.

"We are assembled under the auspicious presence of three generations of the family Hearst. Regents, students, and faculty have assembled here to look upon this occasion, knowing it has great significance. For this is the best building of its kind ever reared for the advantage of the sons of men. It is a building to the memory of a plain, honest, good miner, who had a good heart toward his fellow men. He was a man who did much for humanity. His was the riskful search in the hard places of the earth. He took his riches from the hills, and stole from no man, nor lessened thereby any man's store or any man's opportunity."

The next speaker was Mr. John Galen Howard, the architect, who delivered a scholarly address; saying in part:

"First of all let me seize this auspicious moment publicly to acknowledge my heartfelt gratitude, not only from the most personal and intimate point of view, but as a member of the community—the great community at large, and even more of that smaller and more dumb, more secluded community of art, for which I feel the most poignant concern—let me express my gratitude, I say, for the very exceptional opportunity which was presented in the design of the Mining building. The most fortunate conditions were most fortunately combined at the inception of this work. Springing as it did from the wish of its founder to set up a worthy memorial of her husband, which should consist in the carrying out of a great public benefaction, the work began great and noble; in beauty and in breadth the idea of the memorial developed in the heart of its founder until it blossomed in the magnificent plans for the Greater University.

"We have tried to make our building so that its main structure shall be, as far as possible, a mere shell, whose interior portions may be torn out, adjusted, rebuilt, if necessary, without affecting the strength or aspect of the whole, and at a minimum of cost. For instance, the need of innumerable chimneys and ventilating flues for furnaces, hoods, etc., presented itself as a serious difficulty at first, especially as chimneys, connected with such furnaces as are to be installed here, burn out in the course of time and require to be renewed. This difficulty we overcame by building all of the chimneys which are likely to be subjected to such extreme wear and tear entirely independent of the structure proper. Any or all of these chimneys can be taken down to the foundations without in any degree affecting the building or its equipment, excepting as the actual reconstruction of the chimneys themselves obviously involves such changes.

"The dominating idea in the arrangement of the parts of the building is to keep the administrative and more public parts of the building in the front or south portion. Of these the most important, artistically, is the great memorial vestibule-museum, which occupies the centre of the south façade, lighted by the three great arches, under which we sit, and running through three stories to the roof.

"Behind this southern suite of apartments are three wings extending toward the north; the central space, which is the core and heart of the building, being virtually a great top-lighted court, to be devoted to the purposes of the mining laboratory. The east and west wings on the exterior, corresponding to the central court in the interior, are arranged for metallurgical laboratories and for special and research laboratories. Above these are a series of drafting rooms.

"Within, everything is work-a-day, substantial, and

convenient, but totally devoid of ornament, as a building of this character should be. It is a mining building first, last, and all the time, both inside and out. We have sought to secure beauty, not by easy masquerade and putting on of architectural stuff, but by organic composition, working from within out, and letting the heart of the thing speak.

"Useful; beautiful. Our dearest wish has been that this building should be able to brave these times and the times to come with a front modest, yet frank—simple, clean, sterling, permanent—beautiful in its sincere and assured though reticent way, but devoid of anything remotely suggestive of overdoing in the way of ornament or pompous grouping of its parts—its poetic message stripped of verbiage—classic to the core, yet classic of that primitive type which might almost be called archaic, were it not that it is quickened by the breath of modern life."

Then followed Mr. S. B. Christy, dean of the College of Mines; his eloquent speech was much appreciated,

human nature, stronger even than the desires for personal immortality, is the desire that the memory of those we love shall endure in the land of the living. But how seldom is that desire realized!

"The only permanent monument to the dead is service to the living. The greater and more universal that service and the deeper it takes its hold upon our common human needs, the more enduring the monument.

"For the first time a fitting monument has been erected to one of those strong natures that possessed not only the creative imagination to see great possibilities of wealth in what appeared to others mere barren wastes of rock, but also the sturdy faith in Nature that actually moved mountains to realize those imaginings. Such men have created an empire. It is timely and fitting that a monument should be created to one of them.

"It was an adequate deed. Deep rooted in the eternal hills, this memorial to Senator Hearst raises its noble head into the luminous air, and stands in simple dignity, beauty, and strength. Hewn from the solid granite of



The Mining Building, University of California.

being punctuated with applause. Among other forceful things, he said:

"In the history of mining schools this noble building marks a new achievement. Never, until it was undertaken, had the chief department of a mining school been adequately housed. Everywhere in Europe, as well as in America, the fundamental and necessary, but for this purpose, auxiliary departments, have needed so much space for their laboratories and museums that the department of the mining school which deals with the mining and working of ores, the department in which the work of all the others culminates, has had to struggle with them for room to exist and means to develop.

"We are here to commemorate a noble act. This was a generous deed. Who of us, overwhelmed with sorrow, stops to think of others? We all condone and even expect selfishness in those who suffer; and it is only a deeply generous nature that can think of others at such a time.

"Years of anxious waiting, fire and flood, earthquake and tempest, have passed since the idea of this noble memorial was first conceived; but the mind that conceived it has never stopped to count the cost nor to measure the sacrifice.

"It was a wise deed. Among the strongest desires of

our own Sierra Nevada mountains, molded from the plastic clay of our own valleys, and bound together with bonds of steel; designed with consummate skill, and executed by hands that loved their work; it went through the great earthquake absolutely unscathed, as if Nature herself had taken it under her protection."

Mr. Wheeler then introduced Mr. T. A. Rickard. The President said:

"As a representative of the profession of mining engineering, and as a representative of the mining industry at large, I am glad to introduce T. Arthur Rickard, editor of the MINING AND SCIENTIFIC PRESS, and I am sure you will be as glad to hear him as I am to give this introduction."

The address delivered by Mr. Rickard, which was cordially received, will be found on another page.

Then followed a pretty incident. Mr. Wheeler walked down the steps, and taking little George Hearst (3½ years old) by the hand, he led him from his mother's side to a position on the steps of the building in full view of the throng. The students broke out into a cheer, that echoed among the groves of eucalyptus that frame the campus, while the sunlight played on the serious face of the child.

Thereupon Mr. William Randolph Hearst was intro-

duced, and made a speech which evoked repeated applause. He said:

"My Friends: My mother has a great happiness, which I and George Randolph share, in erecting this monument to the memory of George Hearst and expressing in this memorial his connection with a great and valuable profession and his interest in the University of California and in the State of California.

When George Hearst first came to California in 1850 the bare hills of Berkeley looked across the bay to the bare hills of San Francisco. The tents of San Francisco huddled at the water's edge. But soon the city grew and covered all the hills.

"A year ago the hills were bare again; bare and black and desolate; and there were those who feared the future and doubted and despaired. But now in one short year the hills are once more covered with the myriad buildings of a mighty city—a proud, defiant city, which no catastrophe can conquer; which no disaster can discourage or destroy!

"It is a pleasant time to dedicate a building which a pioneer of the past offers to the generations which shall succeed him. It is a time which justifies fully and completely the beautiful confidence which the pioneers of California had in the glorious future of this great State.

"The founders of California were a strong and courageous race of men. They reached this country through difficulties and dangers; they wrested their fortunes from the rocks; they gained their knowledge in the hard school of experience.

"They loved the land of their adoption; they pictured its progress, dreamed of its development, and all the time they builded, strong and true, the firm foundations of its greatness and prosperity.

"And all they did, they did for us; and all they gained, they gained to leave us; and institutions such as these are founded to make our paths of learning pleasant places, and to transmit to us and to generations yet to come the hard-earned knowledge that these pioneers acquired.

"It is for us of the present generation, for you of the coming generations, to carry on to full fruition the noble work which the founders of California so well began. In the direction and prosecution of that work this great university will play a leading part; and if this institution dedicated today shall do its share and be of service, my mother will be richly rewarded.

"But, my young friends, it is just as well to realize at the starting that a mining building does not make a mining engineer. Scientific cutting may be needed to develop the full brightness of a diamond, but no amount of cutting will make a pebble shine.

"Success is not hidden in these hills, but lies deep down within your hearts and souls, and with much labor must be dragged from there into the light and assayed in the fire, just as the precious metals must be dug from the earth's depths and smelted in the furnaces and wrought and made to be of value to mankind.

"My young friends, you can and must and will succeed. Success is the destiny of California—the heritage transmitted from your sires!

"My mother rejoices at this opportunity to contribute something that may be of value to you in your careers; and we are proud to stand here today connected in some measure with the achievements in the past of George Hearst, to whom this building is dedicated, and with your achievements in the future, my young friends, to whom this building is presented."

Then the President called upon the audience to conclude the proceedings with the singing of 'America.' And so ended the ceremony of dedicating a building of deep significance to technical education.

California Ore Testing Company.

The lack of ore testing facilities west of Salt Lake City, and the rapid development of the great mining regions of Nevada, have led to the installation in San Francisco of what is probably one of the most complete and elaborate ore-testing equipments in America. The purpose of this plant is to solve problems of ore treatment, particularly with reference to the treatment of gold and silver ores in which cyanidation plays so important a part. Operations will be on a large scale, and ores will be worked preferably in carload lots. But the plant will be in no sense a custom mill. A detailed report will be furnished with each test outlining the proper method of treatment, with recommendations as to the best apparatus to adopt. What has hitherto discredited ore-testing plants is that they have usually been in the hands of apprentices and chemists with little or no practical field experience. Their conclusions are hardly more than a disconnected report of routine experiments, from which the mine-owner obtains no guidance, and little practical information. To guard against slovenly work, the Company has secured the services of Abbot A. Hanks, the well known assayer and chemist, as manager, and F. L. Bosqui, as consulting metallurgical engineer.

The plant was designed and installed by the Coast States Construction Co., in consultation with F. L. Bosqui. It is equipped with a laboratory where small tests can be carried on preliminary to the mill-runs.

The scheme of treatment is as follows: The ore is delivered to a Blake crusher and elevated to a Snyder sampler, the reject being delivered by chutes to the bins, the sample dropping to the sampling-floor, where it is quartered down for assay. There are four storage-bins for ore to be reduced by wet processes, the two smaller bins to take the oversize and undersize from a shaking screen, the former passing to crushing rolls. These small bins, therefore, are set aside for experiments in dry crushing and from them the ore may be trammed direct to the cyanide leaching-vats. From the other bins, the ore may be fed either to rolls, a five-stamp battery, a three-stamp battery, or to a Huntington mill. There are three sets of copper amalgamated plates, from which the pulp is raised by a sand-pump to a Callow screen. Directly under the screen is a double-cone hydraulic sizer, and by means of the screen and sizer, three distinct products are made preparatory to concentration, which, by a very flexible system, can be carried to any one of the three concentrating machines, namely, a 6-ft. Frue vanner, an improved card concentrator, and an A. & E. canvas slime table.

The pulp from the concentrators is again elevated by a pump to a Boss classifier, which separates the pulp into sand and slime. The sand passes to the leaching-vats, the slime to a settling and decanting vat. The slime is treated by cyanide solution in an 8-ft. Hendryx agitator, and passes thence to either the Butters or Hendryx vacuum-filter. An Abbé Jumbo tube-mill of one-ton capacity has been installed for fine grinding. This is charged from the leaching-vats, and the discharge passes to the agitator and thence to the vacuum-filter. Suitable water and solution-vats have been provided, and several individual zinc-boxes for precipitation.

The company has given special attention to the type of apparatus installed, and has endeavored to make the plant sufficiently elastic to meet the widest variations of treatment. As the occasion arises, other machinery will be installed, but the policy of the management is not to adopt any new inventions or processes until a long practical demonstration has proved their value.

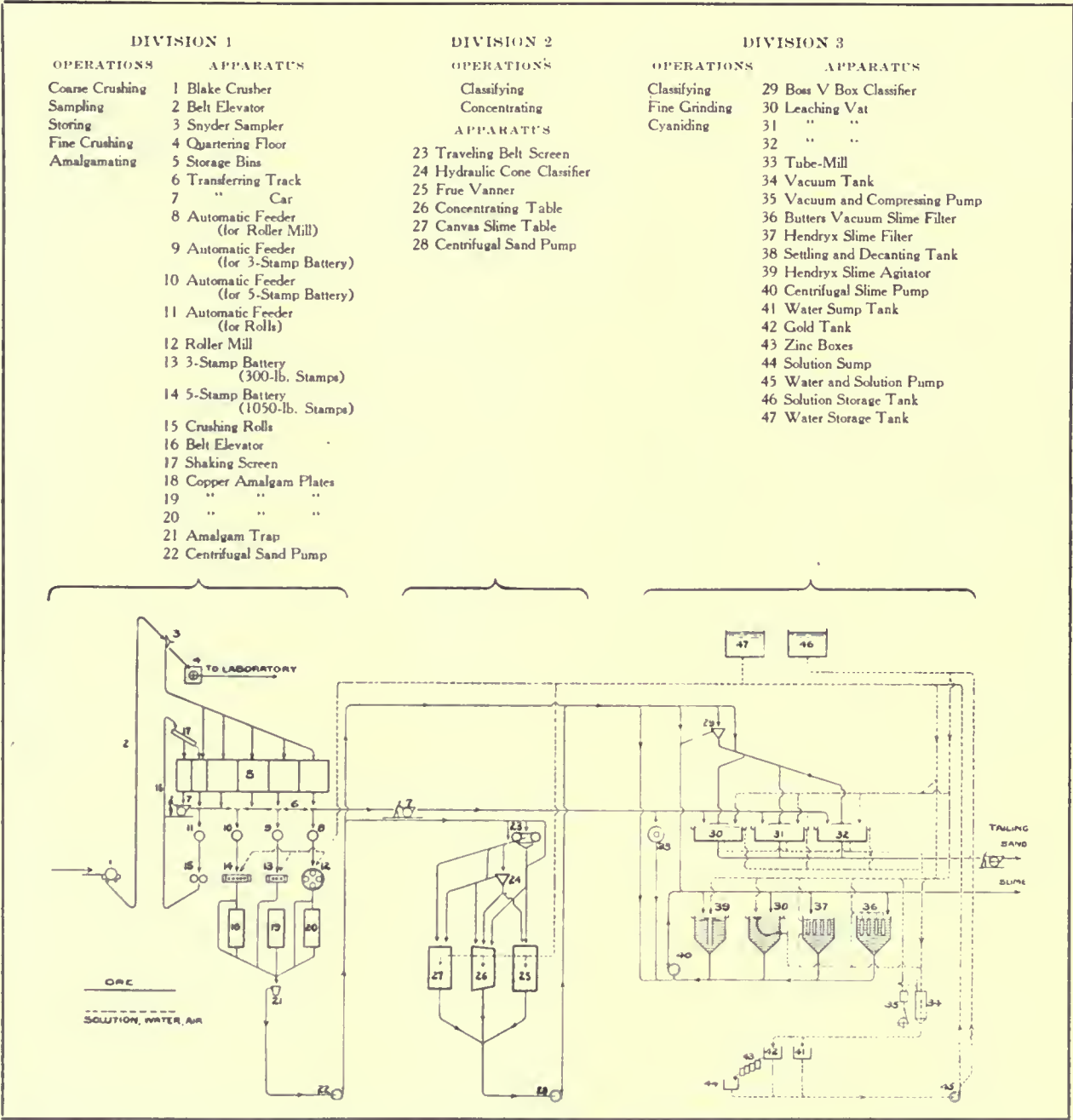
The plant is situated on Bay St., near Jones, in San

Francisco, and the office is at 425 Washington St. All communications should be addressed to the office. A descriptive circular will be furnished on application.

OIL IN BURMA.—The oil mills of the Burma Oil Co. are large and are situated at Poozoondoung, on the river a short distance below Rangoon. This is the third largest oil company in the world, but fears foreign competition, and so far has succeeded in blocking all efforts to secure permission to erect storage tanks at Rangoon. This forces its rival to import all oil in cars instead of in tank

value of \$8,568,900 in 1906, as against 16,542,432 gal., valued at \$2,654,038 in 1902. A high grade of water-white oil is now locally refined and claimed to equal that from America. At present Burma exports little fuel oil, though this is used in the refineries and tank steamers of the Burma Oil Co., and on several of the Irrawaddy Flotilla Co. steamers. Consignments of petroleum have been sent to India, but as yet on a very small scale.

NEW CHILEAN RAILWAY.—Work on the railway tunnel through the backbone of the Andes is making excel-



Flow Sheet of Testing Plant.

steamers, which puts the Standard at a disadvantage. At the same time the Burma Oil Co. is enlarging its facilities and improving the quality of its oil, so as to gain the complete monopoly of the Indian trade. It commenced its own transport in tank steamers in 1900 and has raised a fleet of vessels of a capacity of 500,000 gal. each. It has established ocean installations for bulk oil at Rangoon, Chittagong, Calcutta, Madras, Bombay, Marmagao, and Karachi and has besides for the distribution of its oil a network of minor installations all over India. The exports of kerosene oil continue to increase rapidly, amounting to a total of 52,926,407 gal., of a

lent headway, about as much having been accomplished during the past six months as for the previous 18 months. At the present rate it should be completed before the winter season of 1909 sets in, which will be May 1 of that year. The tunnel is at an altitude of 11,500 ft., and is about 24 miles long. The State railways of Chile are valued at \$61,340,264, of which \$11,684,169 is invested in rolling stock. Nearly all the equipment is of European production. Extensive lines are planned for the near future. The cost of operating these lines for 1906 was \$7,007,379. The expenses exceeded the receipts by \$888,539.

Keeping Account of Supplies.—I.

Written for the MINING AND SCIENTIFIC PRESS
By MATT. W. ALDERSON.

A great many mine managers, while recognizing the obvious advantage such a record would be, are no doubt deterred from keeping an account of supplies used by each individual miner because they imagine it must involve a great amount of work. Not having attempted anything of the kind, they think it must be quite a complicated affair. But the most complicated thing becomes simple when its details are systematized.

A knowledge of cost is considered to be the secret of success in the manufacturing world today, and great pains are often taken to know the exact cost to a fraction of a cent of each piece that goes into the finished product. How few in the mining business ever think to get down to details and know exactly what is being done. "If the mine pays, we are in luck; if it doesn't pay, we're out of luck." But whether a property pays or not would not seem to be a sufficient excuse for lack of approved business methods. Then in mining, as in other fields of effort, there is a better chance of success when things are run on business lines. It is easy to find mines where one man will use twice as much dynamite as another in doing the same work. It is easy to find men who will burn three candles where others will burn but two. It is easy to find persons working properties who have no idea as to which of their men are economical and which extravagant. No attempt is made to find out. In other lines of business it is found necessary to protect the house against those disposed to steal from it, but in the mining business it is assumed that everything is all right. Most miners are honest, but occasionally a man will pocket supplies and walk off with them. A few sticks of dynamite a day will in a month give a man a 50-lb. box full and it is never missed. It is not because every clerk is a thief that the business man must throw safeguards around himself; but because an occasional employee is unable to resist the temptation to do wrong. Why should not the intelligent mine superintendent be up-to-date in his business methods? When the subject of saving on candles and dynamite is broached, many will say, "Oh, that's too small a thing to bother with." But suppose there are 50 men and each of them used two candles a week more than he really should (and there are hundreds of mines where a worse record than this is made), there is an unnecessary loss in that mine of \$100 per year. And if that much loss can be shown on one of the smaller items, is it not reasonable to suppose that there are larger leaks elsewhere? And isn't a hundred dollars worth saving? Isn't it better in the owner's pocket than wasted in carelessness or extravagance? What would be thought of the cabinet-maker who would give to his workmen three boards to make what could be made with less than two, and let the men carry the unused material home? He would be laughed at as exceedingly foolish. And yet that is what we do every day in our mines.

Many managers are no doubt liberal in setting out supplies to their men, because they feel that they must be good to the men, that they must avoid giving the idea that they are stingy. But one is not good to his men who trains them in extravagant ways, and allows them to carry home with them what is really not theirs.

The giving out of the supplies is nearly always left to the judgment of the foreman, generally a man with a good practical knowledge of mining, but without business training. He is apt to do as he has done in other mines with which he is familiar. If it were suggested that he keep a record of supplies used, he would most likely

think that such work should devolve on clerks in the office.

How many candles should a man receive? A standard authority, in speaking of illuminants in mine work, says: "The consumption averages three candles per man per shift." At one mine with which I am familiar, managed on excellent business principles throughout, the men receive three candles one day and two the next. This is the most economical practice I know of. Many mines issue three candles a day to their men and many others let the men help themselves. I turn to my record and I find the following:

		Average per week.	Average per day.
1 man	8 weeks.....	13.75	2.29
1 "	10 "	13.40	2.23
1 "	9 "	12.11	2.02
1 "	8 "	11.12	1.85
1 "	8 "	10.12	1.68

The first three men of which record is given above had to light their way hundreds of feet in going in and out from their work, part of the way in a strong draft, and used their snuffs with which to warm the water of their powder-thawers. The last two used candles in regular work only. More candles are needed in some places than in others. Thus the man working with a machine, where there is a strong draft, will use more candles than one at single-hand work in the end of a level. Where the levels of a mine are lighted by electricity and men need candles for their work only, good men will not use two candles in an eight-hour day. The cheapest candle on the market will burn five hours if held in an upright position and burned where there is no draft. I have timed myself more than once to find that in mucking, where the candle was moved frequently, one would last me $4\frac{1}{2}$ hours. When I was drilling and the candle hung undisturbed most of the time, it would last longer. If I were to use an average of two candles a day under a boss who understood his business, I would expect him to know that something was wrong and needed looking after. The issuing of three candles a day comes down to us from the time when it was sometimes necessary to walk thousands of feet in the light of a candle and then work 10 to 12 hours. Now when entries are lighted and the hours are reduced to eight, we continue the practice.

At many mines the men receive a candle a day more than they use. I know of several mines where the expense for candles can be cut squarely in two. I know one manager, a man of more than local prominence, who would be dumbfounded if shown that he was giving his men two boxes of candles a week more than they used. Yet that is what he is doing, month after month. It's a little waste of \$582 per year, that's all.

At some mines effort has been made to check unnecessary waste by giving the men candles of a special color. But this does not get at the root of the matter. This does not prevent the men when they get a new supply from emptying their candle sticks and putting in fresh candles. As the men do this, they throw away lengths varying from one to three inches. And the longer length is good for two hours. Where a man is of an economical turn, he does not waste, but takes his savings home or gives it to some one with a family who needs more light in the home at night. Every effort to make the prevailing method a success seems to have resulted in failure. It is radically wrong from the start, and cannot be swung into line in an effort to make the issuing of supplies systematical and economical.

In a free-milling ore, the gold occurs in such a form that it is readily and completely recovered by crushing and amalgamation.

Education of Mining Engineers.

By T. A. RICKARD.

*When I was invited to be present on this interesting occasion, it was stated that a few remarks were expected of me as the representative of the public. The public, as you know, is a much-abused entity; it is supposed to be warmhearted but ill informed, and that is why it is possible for so aberrant an individual as myself to speak for it. Assuredly the public takes a keen interest in the mining department of the University of California and rejoices in any further facilities provided for the education of engineers in this School of Mines.

It may be profitable to consider what the public expects, what it gets, and what it may hope to get from the educational advantages offered by the scheme of instruction that is typified by the splendid structure opened on this day. I need not tell you that the public is unreasonable in some of its expectations, for that has been a characteristic of the public from time immemorial, from the day when in Rome it cried for 'bread and circuses' to the day when in San Francisco it expects cheaper water and more theatres. The public is unreasonable, for it supposes that the young men who undergo three or four years of tuition in a School of Mines are necessarily mining engineers, fully equipped to run a smelter, direct the operations of a mine, or pass judgment upon the value of an ore deposit. Occasionally the error of the public is shared by the young graduate himself, who is ready to accept responsibilities as large as his lack of experience. The sequel is lamentable. A career is spoiled; the public grows that scientific men are impractical, and forthwith entrusts the spending of its money to the other fellow—the man called 'practical' because he is ignorant of technical science. The result is again disastrous; for the industry of mining requires more than the rule-of-thumb of the untrained worker and more than the undisciplined theory of the young graduate; it requires that method be joined to experience, that the thought of the lecture room be chastened and illuminated by the realities of life, that is, by getting alongside of facts.

The public expects that the youth sent out from these laboratories and libraries shall be the finished product of a highly specialized education. That is well. To the young man trained here the world is an oyster and his training the instrument for opening the great bivalve that contains the pearl of success. But in the enthusiasm of its belief in the efficacy of a particular curriculum, the public goes too far; it expects the sons here educated to be able to earn big salaries, to discover mines, to guide the uncertain footsteps of finance—all of which is magnificent, but within the gift of no course of instruction as yet devised by man or regents. Such expectations express the flamboyant spirit of an enterprising people and they are eloquent of the respect that the modern world feels for science. Science is a light to make plain the orbits of the stars and to illumine those dark places underground where the miner digs for golden ore; science has done so much to advance the complex method of living we call civilization that mankind, especially that nondescript portion of it called the public, is disposed to ask the impossible. A course in geology will not turn a young man into a divining rod, a few lectures in chemistry will not graduate an alchemist, nor will all the folios in the library teach even the most energetic where to look for the hidden ore. Before science was, common sense was, and experience, and character. These are all needed, and these come slowly; they bud on the campus

of the University but they come to the full flower only in the arena of life.

And what does the public get from a School of Mines such as this one of the University of California? The answer is obvious. It is said of men that by their deeds you shall know them; of Schools of Mines it may be said that by their graduates you shall judge them. If you desire to ascertain what the mining department of the University of California has done for the advancement of a great industry, you must travel, you must go to the waste places of the earth, to the high mountains and the wide deserts, to the tropical South and the frozen North, to the islands of the seven seas, for there you will find the sons of Berkeley, and you will find that they have 'made good.' It has been my privilege to meet the alumni of this School of Mines in many lands, and I can say, without prejudice, for my Alma Mater is an older less progressive lady far from here, that the Berkeley mining graduates have done honor to the University of California. How much of their efficiency is due to the fact that they are the sons of men that explored a continent, how much of it is due to their being the citizens of a commonwealth that gives to each man an equality of opportunity, whether it was due to innate or acquired qualities, it is not for me to say off-hand, but I do know that it is due in large measure to an excellent training and to capable teachers, particularly to professors having the rare ability of Samuel B. Christy and Andrew C. Lawson. If the public expects good men to be graduated from this School of Mines, it ought to be content, for it has obtained them. The records of the profession of mining and metallurgy are liberally sprinkled with the names of Berkeley men that have won an honorable reputation by the exercise of their ability. It is fitting on this occasion to mention the names of some of the past students that have gained distinction in mining, metallurgy, and geology: In South Africa, Gardner F. Williams and his son Alpheus, Harry H. Webb, Wager Bradford, R. H. Robertson, Henry Hay, William W. Mein, L. A. Womble, Paul Selby, the three Hoffmann brothers (George, Carl, and John); in metallurgy, Charles Butters, C. W. Merrill, F. L. Bosqui, P. R. Bradley, E. L. Oliver; in geology, F. L. Ransome, Charles Palache, George D. Louderback, John A. Reid, S. Tangier Smith, F. C. Calkins, Adolph Knopf, and E. S. Larsen; in general professional work, R. Chester Turner, Ross Hoffmann, Ernst Denicke, Arthur C. Nahl, E. A. Nis, T. D. Morphy; in Ecuador, F. M. Simpson; in Korea, A. E. Drucker; and nearer at home, one of the foremost mining engineers of the world, F. W. Bradley; his associate, Stanley A. Easton; and my own kinsmen, Thomas and Edgar Rickard.

Like the jewels on the breastplate of the high priest, the names of good men give lustre to their University, and they do honor to the School of Mines that honored them. And let me pay a tribute to the greater number of those destined to win no fame, to make no splash, to raise no dust, who in a quiet way are doing their duty in mine and mill the world over. If their education has not been in vain—and I never doubt it—they will be content with the daily task well done, and the routine work faithfully executed; even if their names do not appear in print or in the froth of the daily press, they will not be without honor from those that know them, and the warm heart of their Alma Mater will beat as truly for them as for those that have won a reputation.

And what more may be expected of this School of Mines if it has done so much? Something more remains. This School of Mines is a part of a University, it is expected that the graduates in mining shall have the uni-

*An address delivered at the opening of the new Mining building of the University of California, on August 23, 1907.

versity spirit. That does not mean getting together to give the college yell, that does not mean fraternity pins, nor the solidarity of a trades union, it means much more—a love of knowledge for its own sake, a desire for truth as the only scientific method, a loyalty to principles that is superior to circumstance, and moral courage that is better than that of the football field—in a word, the qualities that make a good citizen, for a good citizen is far more than a successful professional man. Gentlemen, it is the character and style of Joseph Le Conte that I want to see superadded to the technical ability and scientific training of the graduates from this School of Mines. It is twenty-two years since I first came to Berkeley on a visit, then fresh from the classroom of Thomas Henry Huxley, and I took the opportunity to listen to some of the lectures of Le Conte and to have the honor of an introduction to the great geologist. It is fitting on this occasion to refer to the man who first gave fame to the University of California; he was a thorough student and a true philosopher; above all he had those sensibilities that make the gentleman, in thought, manner, speech, and act. He typifies real university culture, not mere dilettantism, but the sincerity of science, which offers windows into the infinite, and the generosity of a liberal education, which “widens the intellectual field and adds to the fleeting present those old and new worlds of the past and future.” A School of Mines whose titular chief is a professor of Greek, and a statesman, ought to turn out no narrow specialists, no lop-sided half-educated mental dyspeptics, but men of broad culture, lofty ideals, and wide sympathy. That is what the public may hope to get, and if it does not hold such hopes, it ought to.

But, Sir, in behalf of that portion of the public immediately interested in mining and having a desire to see this School of Mines even more directly useful in the scientific development of industry, I venture to make a practical suggestion. You have a splendid building, but architectural triumphs do not constitute colleges, any more than the house itself makes the home. More is needed. It is true you have a mining department of established reputation, and it existed before this building. You house it now in suitable quarters. These finer quarters indicate a larger sphere of usefulness, but to confirm the highest hopes of the public it is necessary to have an adequate teaching staff. These granite columns are handsome indeed, but they are only an adornment; the School of Mines rests in its professors and students, in the spirit that animates their efforts to train and to be trained in technical science. In the dean of the college and in the professor of geology you have two men that can hold their own anywhere; they are recognized in the mining world as leaders in their subjects and in the teaching of them. That is well known. Nevertheless, in regard to mining and metallurgy, at least, the field of knowledge is so wide and it is widening daily so fast that no one man can keep abreast of it. I say deliberately that no professor of mining or of metallurgy in any school of mines in existence keeps in close touch, or can hope to keep in proper touch, with the development of the arts concerning the practice of which he lectures daily—simply because he cannot be in two places at once. His vacations are occupied with summer schools and with sundry duties that consume even that short period of supposed leisure. His sabbatical year comes at intervals too long to serve the purpose I have in view. What is needed is the endowment of the chairs of mining and metallurgy so that there may be two professors for each chair, one man to lecture as a teacher, the other to study as a scholar in the mine, at the smelter, wherever he can best accumulate the latest knowledge on his subject. Let them take turns—a year

of learning followed by a year of teaching, successively. Thus your lecture room will give no distant echo of the mine and mill, but will be in instant harmony with the latest phase of progress; it will be a place to learn not how things were done ‘once upon a time,’ but a source of instruction telling how they are done now, in the vivid palpitating present. The first School of Mines that adopts some such method will be in accord with the requirements of an industry the wheels of which are never resting but always advancing. Unfortunately it is easier to get money for a building than for a professorship, for the first appeals to the artistic as well as to the altruistic instinct, and the acquisition of chairs, whether domestic or philosophic, must follow the completion of the house as of the college building. California has many men whom her mines have enriched, may we not hope that one or more of them will supplement the beneficence betokened by this edifice and that those others will contribute the money needed to equip this College of Mines with an adequate teaching staff?

However that may be, a great deal has already been done; you have a School of Mines of which the State is proud, and you now have quarters worthy to house it. The public that goes down the mine in skips takes a keen interest in the welfare of this department of the University and, need I say it, appreciates the generosity of the noble woman whose queenly munificence has crowned this campus with an edifice that is at once a memorial to a miner of rare judgment and a token of the part played by the industry of mining in the history of California.

May this building be consecrated to the service of efficient citizenship and to the industrial development of the Pacific Coast, of America, of the world. May this School of Mines have no enemy save the ignorant, and for a friend—the people of California.

THE EXPORTS from Honduras during the last fiscal year included ore worth \$835,597, and bar silver, \$325,286. Exports from Amapala to the United States during the calendar year 1906 amounted to \$1,102,563, of which \$1,005,466 was gold and silver bullion and concentrate. The other exports included cyanide products worth \$13,584. San Juancito is essentially a mining district, and business there is dependent on the operations of a mining company, which during the calendar year 1906 mined gold and silver to the value of \$1,010,000, all of which was exported to the United States. The imports monthly, excepting explosives and candles, amount to some 50 tons of American goods. The works are constantly increasing, and modern methods of ore treatment are being introduced. A new cyanide mill and electric-power plant increased the property value. To facilitate transportation to and from the coast three auto trucks were brought as a trial, and are giving good service over the newly-finished cart road. In addition to wages for the past year, the company expended in the country for produce, salt, etc., \$95,000; besides, its importations from the United States amounted to \$240,000.

SHASTA COUNTY COPPER DEPOSITS.—The study of the copper deposits of Shasta county, Cal., will be continued this season by L. C. Graton, of the U. S. Geological Survey, who will bring the work to completion by mapping the areal geology of the Little Backbone and Iron Mountain districts and studying three large and a few small mines. Mr. Graton will be assisted in this work by B. S. Butler. The future of the Shasta district is most promising. Three smelters are now in active operation, one old one is being overhauled, and a new one is being built. Copper ores from this district are also being smelted in considerable quantity in the vicinity of San Francisco.

The Clean-Up, Melting, and Refining of Gold Bullion.

By GERARD W. WILLIAMS.

*The absence or presence of objectionable precipitate in the extractor-boxes is a factor that involves careful consideration. Generally speaking, it is advisable to screen the fine zinc, putting back in the boxes such zinc as does not pass through the screen used. In this connection a description of the trommel employed in the Simmer & Jack mill may be of interest. It consists of a cylinder of wire-screening with thin sheet-iron ends. A door is provided in the side of the cylinder; the latter is of such size that it revolves easily in one of the extractor-box compartments or in the washing-box used for the purpose. The gold-coated zinc is placed in the trommel, which is revolved by a handle fitted to the long axis. The trommel revolves half in and half out of the water, and in a few minutes the zinc is thoroughly washed. The washing is more rapid and more complete than where the zinc is hand-scrubbed through a sieve. It is, perhaps, permissible to emphasize here the need of running water through the boxes for at least an hour prior to the clean-up. Not only is cyanide saved, but the danger of hydrocyanic acid poisoning in the subsequent acid treatment is eliminated. In mills where the zinc-boxes become charged with 'white precipitate' (essentially a mixture of hydrated zinc oxide and basic zinc ferrocyanide, with a small amount of calcium and magnesium salts), it is advisable to clean-up at least twice a month. The washing of the zinc promotes better precipitation.

On one mine on the Rand with which I was connected, the solutions leaving the boxes averaged, for all solutions, less than 0.035 dwt. per ton; a result due in no small measure to the care with which the fouled zinc was trommeled twice a month. The cyanide strength of the solutions on this mine averaged for strong solutions 0.08 %, for medium 0.05, for weak 0.03, and for slime-plant solutions 0.025 % KCN. The gold slime and the fine zinc are treated in three ways on the Rand, namely,

1. Treatment with sulphuric acid.

2. Treatment with sodium bisulphate.

3. The Tavernier process.
- Calcination of the washed slime and melting with an oxidizing flux.

The bisulphate of sodium is obtained from the Modderfontein dynamite factory, where it is formed as a by-product. In addition to being much cheaper than commercial oil of vitriol, it is absolutely free from arsenic. All danger of poisoning from arsine is thus avoided. In this connection it may be stated that it is probable that most of the cases of 'gassing' during clean-up are not due to hydrocyanic acid gas, but to arseniureted hydrogen. This second method requires the use of larger vats, as the acid can only be used when dilute. This is no disadvantage in the design of a new plant, the extra cost being small. The mines controlled by the Consolidated Goldfields are all fitted with clean-up plants designed for the use of sodium bisulphate instead of sulphuric acid. The vats are lead-lined, covered, and provided with two flues, and a centrally situated power-driven stirring gear. When sulphuric acid is used, the procedure is similar to that pursued in this State. When all action is over the acid liquid is allowed to settle, and the clear supernatant liquid decanted. In cases where any difficulty is experienced in obtaining clear settlement, the addition of two pounds of painter's size dissolved in a gallon of water will effect a speedy settle-

ment. The slime is then treated with two or three washes of hot water, and after the final decantation is filter-pressed. The practice of placing a sheet of cheap filter-paper over each cloth is an admirable one; it prevents the valuable slime from penetrating into the substance of the cloth. The pressed slime is given a final hot-water wash. The use of hot water in this connection unquestionably facilitates the removal of the cakes of gold slime.

Even after long standing and careful filtration, it will be found that the acid solutions and washes carry appreciable quantities of gold. This is due to the solvent action of HCN in the presence of sulphuric acid, and is particularly the case where an excess of acid remains in the vats after all zinc is dissolved. For assaying solutions the following method was found to yield exact results: To one litre of the solution add 10 c.c. of 1.1 sulphuric acid, and 5 grams of zinc dust. Stir well, and when the zinc is almost all dissolved, add 10 c.c. of 5% potassium ferrocyanide. The resultant reddish precipitate settles rapidly and is easily thrown onto a filter. It is incinerated in a small crucible, fluxed with litharge, sand, and borax. Sufficient carbon is added to give a button of the required size.

The principle involved in this method is now adopted in mills employing the bisulphate process. The spent solutions are run into a large vat, and zinc fume (2.5 lb. to 50 tons of solution) stirred in. After settlement the solutions are run to waste, the assay-value of these discharged solutions being less than 0.1 dwt. per ton.

Filter-pressed slime varies in composition, but the following analyses of the slime before and after calcination may be taken as fairly typical of Rand practice. The analyses quoted are the mean of several determinations of slimes from mines wide apart.

	Before roasting.	After roasting.
	g.	g.
Gold.....	35.8	37.0
Silver.....	3.7	3.8
Zinc.....	2.4	.....
Zinc oxide.....	6.0	27.5
Lead.....	19.1	.....
Lead oxide.....	.....	20.0*
Copper.....	2.2	.....
Copper oxide.....	.....	2.2
Iron oxide.....	1.0	2.5†
Nickel.....	0.5	.....
Nickel oxide.....	.....	0.5
Ferrocyanide [K ₄ Fe(CN) ₆].....	2.9‡
Lime, magnesia.....	Trace.	Trace.
Sulphuric acid (SO ₃).....	6.0‡	8.0
Silica (sand).....	12.5	14.0
Total.....	92.1	95.5

*Lead acetate was used for dipping the zinc.

†The ferrocyanides yield iron oxides (and carbides) on roasting.

‡Some sulphur is present as lead sulphide, not separately estimated.

Two factors are liable to extreme variation, zinc and silica. The presence of the first-named, assuming the slime to be well acid-treated, is due to the presence of the white precipitate. Ferrocyanides of the alkalis are decomposed by sulphuric acid with formation of CO or HCN according to dilution and temperature, but the basic ferrocyanide of zinc which at times forms a considerable portion of the white precipitate is totally unaffected by acids. The amorphous hydrated zinc oxide which forms the basis of the precipitate is practically insoluble in acid. The presence of sand may be due either to sand from imperfect filtration or to dust. The extractor-boxes are not covered.

Copper, nickel, and mercury, if present in the ore, are usually deposited on the zinc, and as these metals are not soluble in sulphuric acid under the condition obtaining, they pass onto the precipitate unchanged. In certain cases soluble sulphides formed from the ore are converted into lead sulphide in the boxes. This may be almost entirely prevented by the use of lead acetate in the sand-vats.

*Abstracted from the *Monthly Journal* of the Chamber of Mines of Western Australia. June 23, 1907.

The gold slime is calcined at low redness for some hours, pulverized when cold, fluxed, and melted in clay-lined Salamander crucibles heated in large reverberatory furnaces. Until 1898 it was customary to melt the slime with borax, the resultant bullion being worth about £3 per ounce. In June of that year the present process was introduced. Manganese dioxide and nitre are used to effect oxidation of the base metals, the process taking place in clay-lined graphite crucibles. The following flux would give a good melt with the calcined precipitate: Gold slime, 100 parts; fused borax, 30 parts; soda, 5; sand, 20; manganese dioxide (commercial), 20; nitre, 7; fluorspar, 5. Silicate of soda is sometimes used instead of soda. The ideal flux probably corresponds to a borosilicate, but owing to the cost of borax it is advisable to form silicates with a larger percentage of metallic sub-oxides than shown in the formula.

The fusibility of zinky slime is much increased by the presence of fluorspar. Zinc fluor-silicate appears to be more fluid than zinc borosilicate. The partial substitution of boric acid (B_2O_3) for borax has undoubted advantages when the slimes contain much base metal other than zinc and lead. The replacement of half of the manganese dioxide by the (chemical) equivalent in ferric-oxide tends to increase the fluidity of the slag. The resultant bullion would contain about 975 to 985 parts of gold and silver; care must be taken to avoid excess of manganese, for, in addition to rendering the slag pasty, it has the property of dissolving both gold and silver. On the larger South African mines these slags are run down in a pan-furnace; the residual slags average, on a well-run plant, about 4 dwt. per ton.

It is a good plan to make up a few trial fusions in J pots and to select the flux that gives the best results. This does not take long, but it saves a lot of annoyance and loss of time when, as sometimes happens, the fluxes do not work well.

The Taverner process, introduced on the Rand in 1903, consists essentially in the smelting of the dried and briquetted slime and fine zinc with litharge on the hearth of a pan-furnace. The slag used is generally composed of old assay slag saved for that purpose. The lead bullion obtained is cupelled. The resultant bullion is high-grade. In some cases the slime and zinc are acid-treated before putting in the furnace.

Recent work has shown that the loss by dusting is insignificant, and not more than the loss which inevitably occurs when calcined precipitates are handled. For the treatment of large quantities of very low-grade slime it may have advantages, but with normal slime containing from 35% bullion it appears to possess no points of superiority over the processes described.

The economic limit to which it is advisable to continue refining is in some degree a factor dependent on the country where the gold is sold. Most refining processes involve a loss in the silver contents, and this becomes an important consideration when deciding between realization in Perth and London. At London, melting charges are based on the ounce bullion, so that, all things being equal, it is advisable to reduce the gross weight of the bullion as far as possible. Deductions are also made for gold bullion containing less than 800 mills gold. Another indirect advantage of refining lies in the fact that greater uniformity of assay is obtainable.

Speaking generally, it may be stated, as an axiom, that as much refining as possible should be effected in the first melt. This object is attained by the three standard methods described as representing Rand practice and for pouring into bars it is customary simply to melt the bullion under borax, a little nitre being occasionally

added during fusion. But there are, especially in the Westralian back country, many mines where the bullion does not average more than 500 or 600 fine, and in this case it is necessary to adopt some method of refining. But in this connection the fact is again worthy of emphasis, that if acid-treated slime is well roasted and then fluxed with an oxidizing flux, little difficulty will be experienced in obtaining bullion 900 fine (gold and silver) in the first melt, and this where the conditions do not permit of that thorough washing of the acid-treated precipitate which is so essential for really good work.

For general mine work, nitre is the best refining agent. The bullion is melted in a clay-lined pot and a thin stream of finely-powdered nitre is run slowly to the centre of the molten metal. Then an equal weight of borax to slag the oxides. The process is continued until the slag, which is skimmed from time to time, is light green in color. The slag is partially soluble in water, and any contained prills are readily separated by crushing and washing. The slag may be advantageously used as an addition to the flux in the next clean-up.

It has been shown that copper acts as a carrier of the oxygen from the nitre to the other metals, and further that base bullion may be simply and economically refined by granulation and fusion of the granules and potassium permanganate and borax. It has also been demonstrated that a stream of compressed air passed through molten bullion will remove all base metals without any appreciable loss of gold except the small temporary loss of small prills in the covering slag.

In experiments made in South Africa good results were obtained from the smelting of bullion rendered specially base for the purpose of experiment. The application of the process is extremely simple. The bullion is melted in a lined crucible and a slow stream of compressed air is passed into the molten metal by means of a clay pipe. By the inclusion of a glass wash-bottle in the air circuit, the progress of the air may be watched and accurately regulated. The metallic oxides are fluxed with sand and borax. The process certainly requires time, but the complete immunity from loss, actual or potential, is a great point in its favor. The cost, where compressed air is available, is small. The final bullion is not only extremely fine, but is also quite tough.

The following details of the second bi-monthly clean-up at the Ida mill, in April, 1907, illustrate certain points in the foregoing notes. Fine zinc and slime were acid-treated and thoroughly calcined on an iron tray over a wood fire. Flux:

Gold slime.....	100 parts
Soda	10 "
Fused borax	35 "
Sand	15 "
Manganese dioxide	20 "
Nitre.....	5 "

In another melt the nitre was eliminated as the roast was exceptionally good, and five parts of borax substituted.

The bullion represented 16.5% of the total weight of gold slime. It was re-melted in another smaller clay-lined crucible, and, when molten, 50 grams of an equal mixture of sand, borax, and nitre were added. The slag was skimmed and the bullion washed with a little borax prior to pouring. The bullion assayed 948.5 fine gold, 31.5 silver. The slag from the melt was fluid, dull red in color, with conchoidal fracture on cooling. Before amalgamation it assayed 1.85 oz. gold and 4.0 oz. silver per ton. Copper is the chief impurity, but large quantities of white precipitate are formed in the weak solution extractor-box, thus materially increasing the percentage of zinc in the slime.

This gold slime, if melted down with borax in a graphite crucible, yields a bullion about 600 fine, together with a certain quantity of highly auriferous matte. The following method was utilized for the purpose of treating a small quantity of such matte: The finely-crushed sulphide was mixed with 50% (by weight) of iron filings and melted in an old graphite crucible.

Fig. 1.

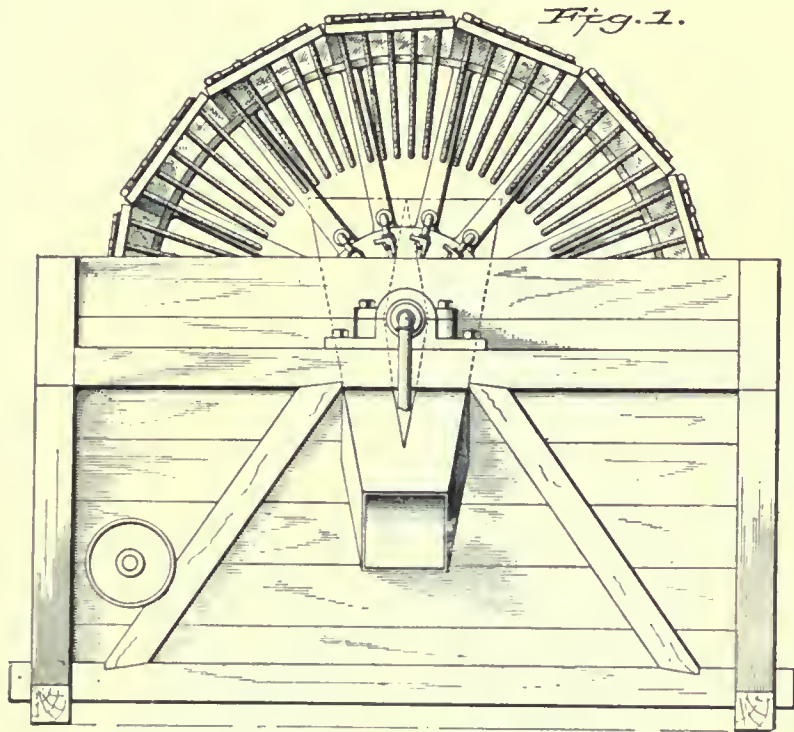
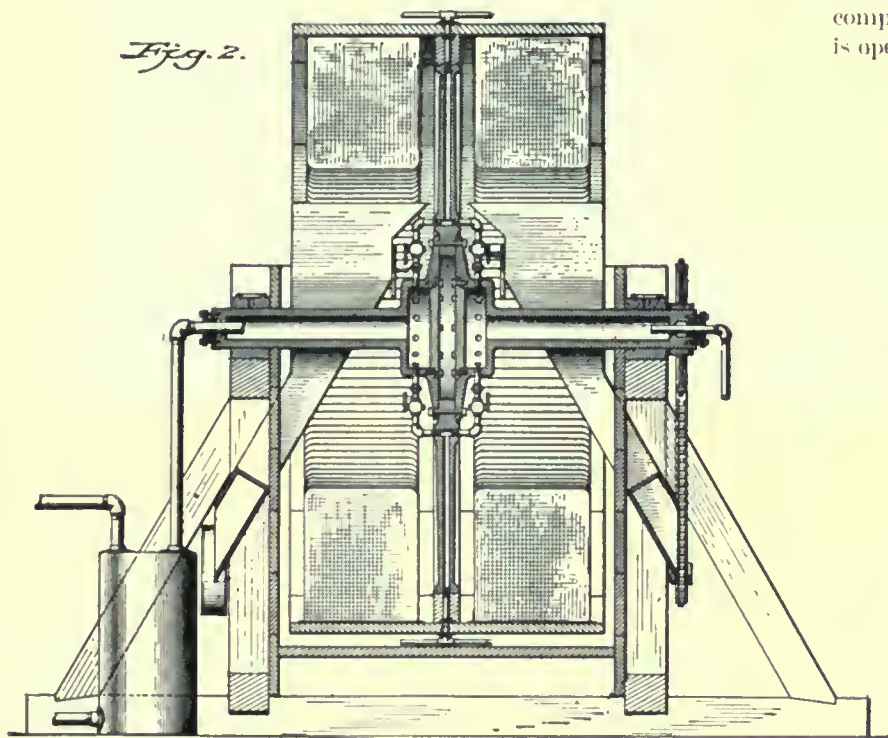


Fig. 2.



When melted, more iron was stirred in until it no longer dissolved. The mass was kept at the highest temperature of the furnace for an hour and then allowed to cool. When cool, the pot was broken and a coppery bullion obtained. The iron displaced the copper, forming ferrous sulphide, and set free the bulk of the gold.

SCREENS with flaring holes with the narrow part up do not blind as quickly as those with cylindrical holes. Thus an old trommel screen makes a splendid screen for a fine jig, and one which many millmen prefer to a wire screen.

The Fairchild Vacuum-Filter.

The accompanying illustration shows the details of a revoluble vacuum-filter designed by O. H. Fairchild, of Denver, for the removal of the liquid from slime during treatment by the cyanide process.

The construction and operation of this machine is briefly described as follows: Suspended in a semicircular vat is a circular filter of 10 ft. diam., composed of 14 sections or groups of filters. Each section is composed of 10 filters radially attached to the inner periphery of the filter-wheel with suitable connections through the hollow spokes and hubs with a vacuum-pump on one side and a supply of compressed air on the other. The individual filter is two feet square and there are 10 filters to each of the 14 sections, which gives a total filtering surface of 1,120 square feet.

To operate this vacuum-filter, the vat is filled with thickened pulp to a point six inches above the hub. The filter is slowly rotated and as each section is immersed in the pulp the valve connecting that particular section with the pump is opened and vacuum-connections are maintained until the section emerges from the pulp at the opposite end of the vat and reaches a point directly over the hoppers that project through the sides of the vat. At the latter point the vacuum-valve is closed and the valve controlling the passageway to the compressed fluid or liquid under pressure is opened to discharge the cake of slime.

Fig. 3.

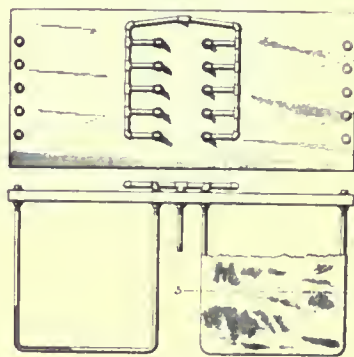


Fig. 4.

Fig. 5.

These valves are actuated by engaging their bell-crank arms with a set of pins at certain fixed points. A three-way valve placed in the compressed fluid conduit operates to admit a solution under pressure and compressed air alternately.

This construction enables the process of filtering to proceed automatically and continuously and permits the discharge of a relatively thin cake of slime, features that will be readily appreciated by cyanide operators. The floor space required for each machine amounts to approximately 135 sq. ft. The filter is manufactured by McFarland & Co., at Denver.

The McDougall Roasting Furnace.

Written for the MINING AND SCIENTIFIC PRESS
By L. S. AUSTIN.

These furnaces have been largely used in the inter-mountain States and mainly on ores containing 27 to 38 % sulphur. They are roasted by the heat developed from the burning of their contained sulphur, the lower percentage mentioned being the minimum that can be roasted without the aid of a supplementary fire to keep up the heat. These ores can be roasted down to 5 to 8 % sulphur, and it has been found that the roast, under favorable circumstances and for days together, can be

capacity of the reverberatory furnace in which the ore is roasted, while if imperfectly mixed the charge is slower in melting down.

With a battery of four 16-ft. McDougall roasters, each having six hearths of a combined area of 870 sq. ft., a test made upon copper-bearing sulphide concentrate during a continuous run of 10 days, gave an average of 36 tons in 24 hours. A maximum tonnage of 47 tons has been attained by a furnace of this size under favorable circumstances. This corresponds to a performance of 65 tons daily made by an 18-ft. furnace having a hearth of 1,200 sq. ft. That is we have

870 sq. ft. : 1,200 sq. ft. :: 47 tons : 65 tons.

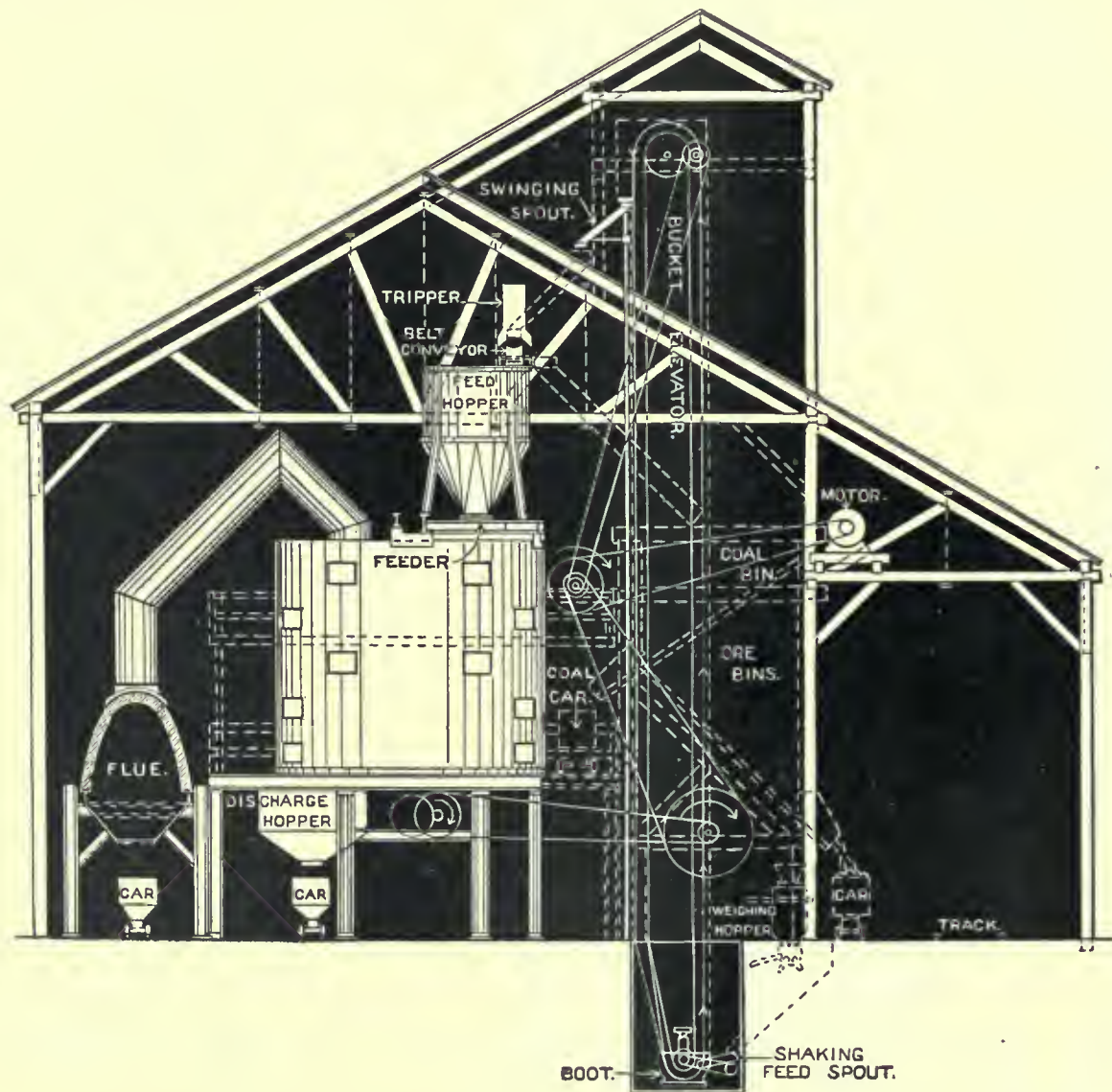


Fig. 1. Elevation of McDougall Roasting Plant.

carried to 2.5%. Butte ores are roasted to 7%, and when smelted in a reverberatory furnace they gave a 40% copper matte, a grade which, under present practice, can be easily converted; hence it has not been sought to make a lower roast than this figure. The time taken to pass the ore through the furnace is 2½ to 3 hours and, in fact, there are 25 to 30 tons in the furnace at any one time including what is in the hoppers. The capacity of the furnace varies with the nature of the ore, its sulphur contents, its moisture, and the fineness to which it has been crushed. Pyrite-bearing ore of the percentage above cited is fine enough if crushed to pass a ½-in. screen, since by decrepitation it breaks up enough to come thoroughly in contact with the air. When crushed to this size and bedded with silicious ore and limestone, the intimate mixture of these latter ingredients assists in increasing the

In the larger furnace (18 ft.) this performance has been attained without difficulty. The water needed to cool the hollow shaft and rabble-arms is 60 gal. per min. delivered at an initial temperature of 70° F., the overflow varying from 103 to 115° F. The repairs on these furnaces are small, the iron parts to be renewed being the plows and rakes, this item amounting to 0.25 to 0.5 lb. cast iron per ton of ore treated. The hearths have to be renewed sometimes, especially the 'cutting hearths,' which are particularly subject to wear and tear arising from removing lumps of partially fused ore. To save the hearth from damage when barring off these incrustations, cast-iron plates cast in Z-form are put in. These constitute the door-sill; they go down through the drop opening and rest on the hearth below; they need no bolts to hold them in place.

When 16 of these roasting furnaces have been driven from a single motor, approximately 25 hp. is needed, or $1\frac{1}{2}$ hp. per furnace.

Fig. 1 is an elevation of a plant where the ore is supplied in a regulated stream to the foot or boot of a vertical elevator, which in turn spouts it upon a troughed conveyor-belt. A movable tripper delivers it to any desired feed-hopper until the latter is full. When the tripper is not filling these feed-hoppers, it may be filling the ore-storage bins. A single attendant can draw from these bins into a car set at the ground level and this is then dumped into the hopper of the shaking-feed. When desired, the tripper can be arranged to deliver coal to a bin in those cases where a supplementary fire is needed. It should be noted that the outlet flue, carrying the hot

peripheries of the hearth in its downward progress. The ore, showering down through the openings, is brought effectively in contact with the upward passing air, but at the same time much flue-dust is formed. Opposite the drop-holes doors *E E* are provided, by which the accretions, which form so much upon the second and third hearths, may be conveniently removed. The ore upon the lower hearth is finally discharged through the base plates by two openings near the periphery, each of 2 ft. by 8 in. area, and enters the double hopper *F F*, 6 by 10 ft. in plan. The shell is lined with fire-brick headers, leaving an effective interior diameter of 16 ft. 6 in. The furnace is 19 ft. high, and its base plate is 10 ft. above the ground floor. The space between hearths is 2 ft. 4 in. The central cast iron hollow shaft *S S* is driven by bevel

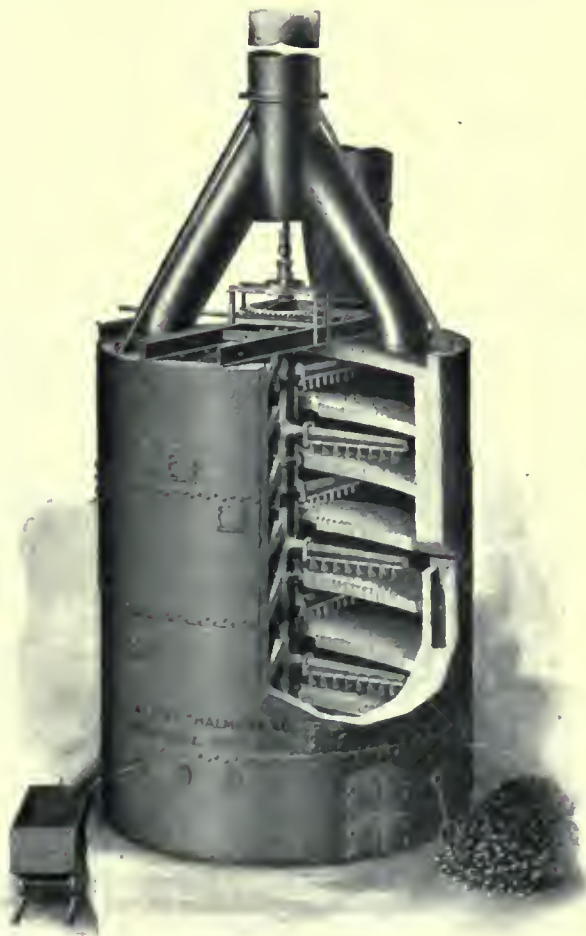


Fig. 2.

escaping gases from the main flue, should be lined with tile, or made of brick. The bottom of the main flue consists of a series of pyramidal hoppers, but these are not attacked by the acid escaping gases, since they are continuously covered with flue-dust.

Fig. 2 represents the latest design shown as a half-sectional, half-outside elevation of a six-hearth 18-ft. McDougall roasting furnace No. 1, as made by the Allis-Chalmers Co. The supply of ore is kept in the hopper *B*, 5 by 7 ft. in plan. This is fed automatically by a reciprocating feed-shoe, the movement of which may be readily modified to suit the feed required. The ore enters quietly at the outer edge of the hearth, thus avoiding the formation of flue-dust. It is spread by the rabblers and is plowed by them toward the central opening of this hearth. Here it falls to the second hearth and is swept gradually outward by the second set of rabble arms *D*. At the periphery it falls through six equally spaced drop openings, each of 3 ft. by 8 in. area. Then it is moved toward the centre, and so, alternately, to the centres and

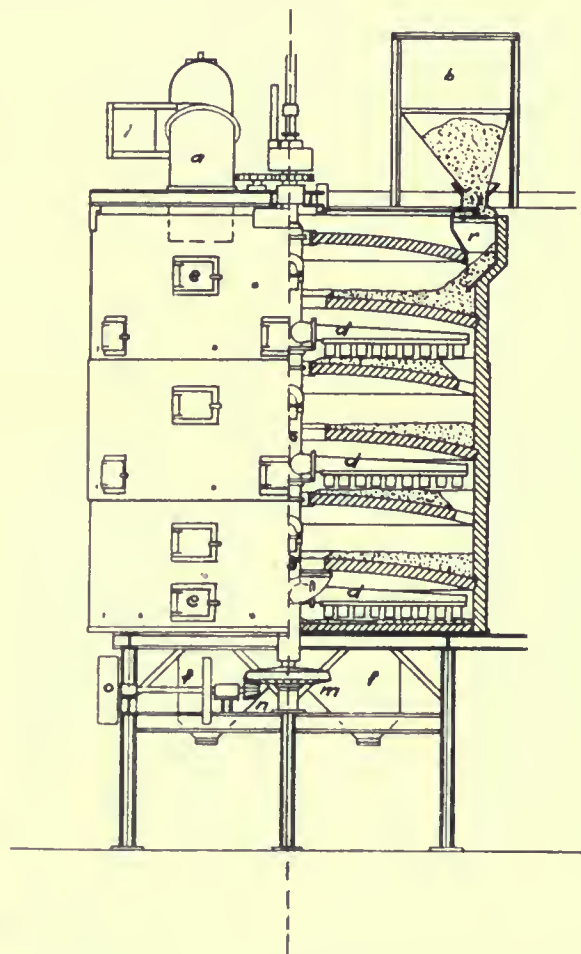


Fig. 3.

gears *M N*, actuated by spur-wheel and pinion on the driving shaft, which also carries the pulley *O*. The rabble arms *D D* are bolted to the central shaft, the joint being made with corrugated copper gaskets covered on both sides with red lead. The water-supply pipe enters the top of the hollow shaft and passes down the interior to a point near the bottom, with branches at each rabble-arm. These branches run through the rabble-arm nearly its full length, and are open at the end. Thus a circulation of water is insured outward to the end of these pipes, and returning by the hollow rabble-arms to the shaft and then rising to the overflow pipe at the top, where it is received into a launder which encircles the shaft.

Fig. 3 is a view, partly in section, of a McDougall roasting furnace, having two fire-boxes with grates, ash-pit and fire-door fronts, one of which is shown. These deliver the products of combustion to a common or single combustion chamber immediately below the lower hearth. The brick lining is 23½ in. thick and in it

are flues 10 by 16 in. area, proceeding from the combustion chamber, and delivering the heat to the second, fourth, and sixth hearths, numbering from the top three flues to each hearth. One of these flues is shown in the section delivering the gases to the fourth hearth. The shaft of this furnace is driven from above. The arrangement and construction of the rabble-arms clearly appear in the sectional view. The furnaces, being set upon the ground, the roasted ore is removed by a single chute to a tram-car set upon a sunken track. The exit flue or pipe is double, joining then into a single uptake. The usual method, however, is to have one or two uptakes leading to a horizontal main flue, or else, as in Fig. 1, to put in a down-take, which leads to a flue at, or near, the ground level. At about the level of the fire-doors will be noticed rods projecting from the side of the furnace. They indicate the position of dampers at the foot of each of the flues above referred to. They are, however, wrongly represented, since these are iron plate dampers sliding through slits in the shell, and they regulate the heat to any hearth as may be desired. As regards cost of roasting, this varies with the locality, since the price of labor is the principal factor. At the Highland Boy smelter near Salt Lake City, in 1892, the cost was 34c. per ton. This included direct charges for repairs, power, supplies, tramming ore, and calcines, and a proportionate share of all indirect and general expense. The eight furnaces take two furnace-men and two helpers per shift.

LIME IN CEMENT.—The amount of lime a cement will safely carry is dependent on the relative amounts of silica and alumina present and also on the care with which a cement is made. Practically all American cements fall between two limits, and the ratio of the bases lime and magnesia to the acids silica, iron, and alumina should not exceed 2.1 to 1 nor be less than 1.9 to 1. To make a sound cement having the first ratio the raw materials must be well mixed and very finely ground. Such a cement will be much stronger, however, than one having the lower ratio. A hypothesis has been advanced that the lime in portland cement clinker exists in three forms: In combination with silica, alumina, iron, etc., to form a magma of orthosilicates, $2\text{CaO} \cdot \text{SiO}_2$, ortho-aluminates, $2\text{CaO} \cdot \text{Al}_2\text{O}_3$, etc.; as the oxide itself in solid solution in this magma of silicates, aluminates, etc.; and as undissolved oxide, that is, lime merely disseminated through the magma, forming with the latter simply a mechanical mixture. If this is assumed, then it readily follows that it is the lime in the second condition which causes the hardening of cement mortars and the lime in the third form which promotes unsoundness. It is barely possible that in some cases with this third form of lime, the lime was at one time also in solution in the magma and crystallized out on cooling. Lime found under such conditions would probably be very slowly attacked by water and hence might easily not slake until after the mortar had hardened, thus causing expansion of the latter with consequent disintegration, distortion, and cracking.

MINERAL DEPOSITS OF ORISSA.—The iron ore deposits in the Bengal province of Orissa have been reported as being practically inexhaustible in quantity, and of excellent quality. A party of Englishmen visited the Guromaishani deposits last year, they were satisfied with the quantity and quality of the deposits, and steps have been taken to organize a company to work the iron, gold, and other minerals which were reported as being found. Indian capitalists are taking a joint interest with London capitalists in the proposed development of the Mourbhunj deposits.

The Prospector.

Enquiries sent to this department are answered free of charge, is submitted by subscribers who are not in arrears. The full name and post-office address of the sender must be given, otherwise no answer will be made. Those who are not subscribers must accompany their questions with a fee of \$3 for each question. No assays are made.

The rock marked Comer is a Basalt.

A piece of Kaolinite was sent from Big Oak Flat, Cal., by L. F.

The mineral Scheelite was sent from Randsburg by A. C. W.

The red red pebble marked C. A. B., Eagle, Alaska, is Hematite.

An impure clayey Limonite was sent by J. R. of Mercur, Utah.

The specimens sent from Iron Springs, Idaho, by J. D. T., are Jasper and Diorite.

The specimen marked A. B. C., Battle Mountain, Nev., is Pyrrhotite in quartz and calcite.

The eleven rock specimens from H. G. G. of Wonder, Nev., and numbered from 18 to 19 inclusive are all Dacites.

The specimen sent from Tokio, Japan, by R. K., appears to be a crushed and greatly altered and silicified effusive—perhaps an Andesite. A closer determination is impossible.

The rock specimens sent from Nogales, Ariz., by E. E. N., are: No. 1, Quartz Porphyry; No. 2, Quartz Porphyry; No. 3, Quartz Porphyry; No. 4, altered Andesite; No. 5, Rhyolite; No. 6, Andesite; No. 7, Diorite; No. 8, Rhyolite; No. 9, Quartz Porphyry; No. 10, Quartz Porphyry; No. 11, Quartz Diorite.

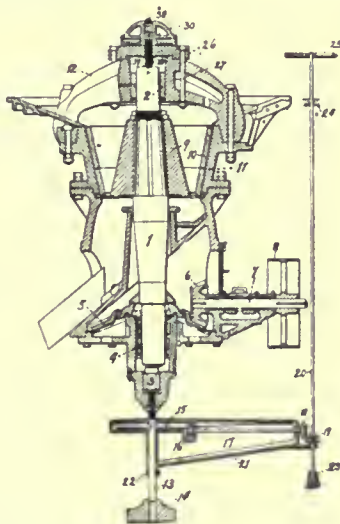
J. C., of Mazapil, Zacatecas, Mexico, sends: No. 1, Tetrahedrite; No. 2, Tetrahedrite, Chalcocite, and Chalcopyrite; No. 3, Tetrahedrite, Chalcocite, Pyrite, and Chalcopyrite; No. 4, Calcite carrying considerable iron, etc.; No. 5, Bornite in Calcite and Andradite; No. 6, Calcite, Garnet, Limonite, and Thuringite with some copper stain.

A SIMPLE DEVICE.—Following is a description of a handy device for removing pump rods, pipe, etc., that have been broken off in a drill-hole: Any blacksmith or mechanic can make this tool, using the size iron to correspond to the size of the hole, and for the iron or pipe to be removed. For instance, for 2-in. holes a piece of iron or steel $\frac{1}{2}$ by 1 in. is good size; about three feet long, pointed at one end with a short piece of round iron welded on opposite end, of suitable size to be threaded to fit a standard one-inch pipe coupling. Rings or elevices can be made of $\frac{3}{8}$ or $\frac{7}{16}$ -in. steel or iron, leaving enough room for the piece to slip through them, whence rings stand at right angles to the spear. The rings can be made to take a firmer grip on the piece by filing them to a sharp edge on the inside, so they will cut into the rod or pipe to be removed. The tool is attached to ordinary gas-pipe, enough lengths screwed together as it is lowered into the well to reach the piece to be removed. By manipulating it properly it can be worked over the rod, and as soon as a pull is exerted the rings drop down and take a good grip. If gas-pipe is not available, a ring can be forged in the top and a rope attached to it, but do not use a rope unless you are sure the piece in the well is not tight, as you would be liable to tear the rope. For larger size wells use iron and pipe to correspond.—*The Drill Hole.*

MINING AND METALLURGICAL PATENTS.

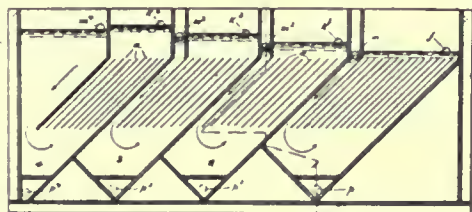
Specially Reported for the MINING AND SCIENTIFIC PRESS.

GYRATORY CRUSHER.—No. 863,284; Herbert I. Keen, Chicago, Ill., assignor to Allis-Chalmers Company, Chicago, Ill., a Corporation of New Jersey.



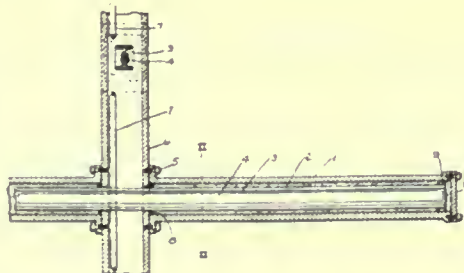
In a gyratory crusher, a shaft, a spider for the upper end of the shaft, a plate covering the spider hub, a jack screw threaded through the plate for forcing down the shaft, and a dust cap for turning the screw and shedding debris away from the same.

MEANS FOR USE IN SEPARATING THE MORE SOLUBLE CONSTITUENTS OF A MATERIAL FROM THE LESS SOLUBLE CONSTITUENTS THEREOF.—No. 863,168; Thomas Griswold, Jr., Midland, Mich., assignor to the Ontario Nickel Company, Limited, Worthington, Ontario, Canada, a Corporation.



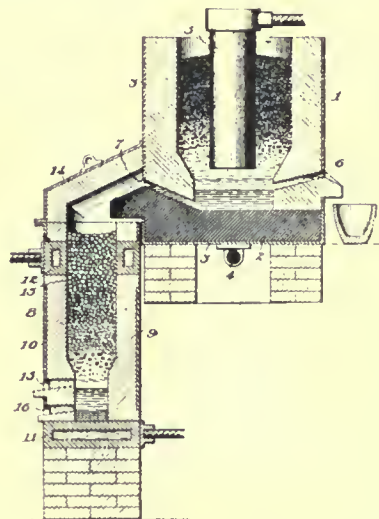
In means for use in separating the more soluble constituents of a material from the less soluble constituents thereof, the combination of a series of settling chambers and mixing chambers; means arranged to convey unlike constituents from a plurality of said settling chambers, respectively, to said mixing chambers; and means for circulating all said constituents through said mixing chambers in the same direction.

ROASTING-FURNACE.—No. 863,187; George E. Kirk, Toledo, Ohio, assignor to Allis-Chalmers Company, Milwaukee, Wis., a Corporation of New Jersey.



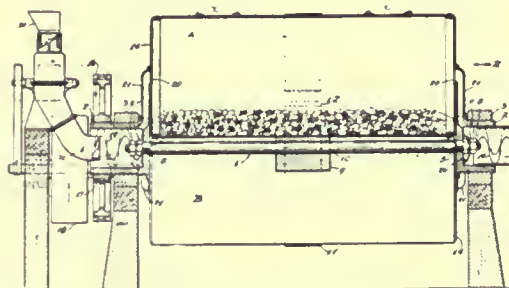
The combination with a shaft, of a supporting member supported by and extended from said shaft, a hollow arm inclosing said supporting member, and a heat insulating packing interposed between the interior surface of said arm and said member.

PROCESS OF REDUCING COMPOUNDS AND PRODUCING LOW-CARBON FERRO ALLOYS.—No. 862,996; Edgar F. Price, Niagara Falls, New York, New York.



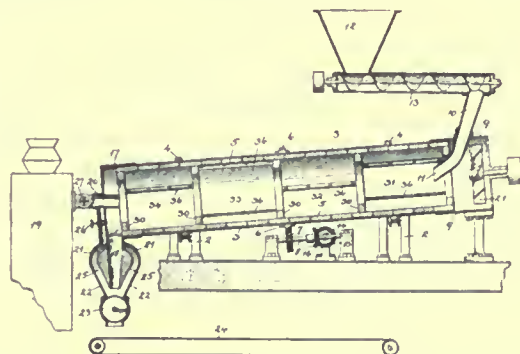
The process of reducing refractory compounds, which consists in percolating a molten reducing agent essentially comprising a highly-oxidizable element through a granular body of the compound.

TUBE OR PEBBLE MILL.—No. 863,483; Richard F. Abbe, New York, New York.



In a pebble mill, the combination of a plurality of receptacles secured together about an axis of rotation and each provided with an entrance opening and an exit opening, means for rotating said receptacles about said axis, a gudgeon at each end of said receptacles and rotatable therewith, conduits leading from one gudgeon to the entrance openings of the receptacles, conduits leading from the exit openings of the receptacles to the other gudgeon and spiral ridges secured in the interior of each gudgeon.

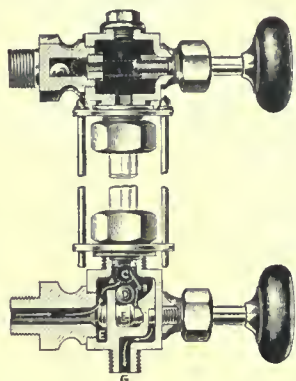
PROCESS FOR BURNING LIME OR OTHER SUBSTANCES.—No. 862,657; James Reaney Jr., Sherwood, Maryland.



The process of burning lime rock or other material, consisting in agitating the material in the presence of a burning heat and during the agitation separating by gravity the heavier unburned particles which settle to the bottom from the lighter burned particles which rise to the surface of the mass and removing the lighter separated particles from the surface.

Automatic Water Gauge.

The objections to many automatic gages are that the automatic devices go to their seats on the sudden opening or closing of blow-off or they become corroded, stick fast, and do not operate at the critical moment. An examination of the Success gauge will convince any engineer that these two objections are entirely overcome.



E is a double-seated valve to close both the gauge and the blow-off. It will be seen, therefore, that every time the lower handle is turned to blow-off the gauge the automatic device or ball *D* is moved by the stem on which it rests. In addition to this the stem follows the course of the arrows *B* to the outlet *G*, creating a downward pressure on the ball *D* and rolling it about in the chamber in which it is located. This great agitation of this ball from three to six times a day prevents it from ever becoming limed up and stuck fast. When the glass breaks everything is reversed; the steam rushes upward to the break, creating a strong vacuum at the lower end of the glass, when ball *D* is instantaneously raised to the location marked *C*, when flow of steam ceases. The upper ball is forced to its seat by pressure from boiler. The double seats of valve *E* can be ground by simply loosening the stuffing nut on handle.

The Penberthy Injector Co., of Detroit, Mich., is the manufacturer.

Smooth-On.

This chemical iron compound was made in 1893 by Vreeland Tompkins, a chemical student and graduate of Rutgers College, the object being to make a chemical iron, that could be easily applied to cracks and holes in iron to make permanent repairs. A compound to make such repairs must metalize practically as hard as iron. It must expand while metalizing, so as to completely fill any opening into which it is introduced and also force itself into the grain of the iron. When metalized, it must expand and contract the same as iron. After two years this was accomplished and a chemical compound made and named Smooth-On, which forms the base or starting point for the different Smooth-On iron cements. These were first prepared only in powder form and used, by mixing with a certain percentage of water, to the consistence of stiff putty and immediately applied to cold metal, as it metalizes rapidly. While very useful where small amounts of cement were required, this cement necessitated a hurrying of the work, when handling large quantities to get through before it got too stiff or hard to work. By further experiments a solvent was found which would evaporate upon the application of heat; this enabled Smooth-On to be prepared and kept in paste or fluid form, until wanted for use. The fluid preparation of Smooth-On greatly enlarged its use, as this cement may be applied to hot or cold metal.

Commercial Paragraphs.

A DECIDED NOVELTY in the electrical signal system has been installed at the Mohawk mine, in the copper region of Michigan. The installation is known as the Richmond Mine Signal System, manufactured by the RICHMOND Co., of Oshkosh, Wisconsin. The Ahmeck No. 2 shaft, another

copper mine, is also putting in a complete Richmond system.

CHARLES T. HUTCHINSON, for many years associated with the Union Iron Works of San Francisco, and of late years manager of the mining machinery department, recently severed his connection with that concern, to accept a similar position with the JOSHUA HENDY IRON WORKS, of San Francisco.

Books Received.

'Public Roads; Their Importance and Maintenance,' by E. R. Buckley. This useful volume of 120 pages is issued by the Missouri Bureau of Geology and Mines, and written by a geologist of established reputation. The book is well illustrated and contains a good deal of practical information on a subject of fundamental importance.

'The Mineral Industry.' Vol. XV. Edited by W. R. Ingalls. Issued by the Hill Publishing Co., New York. This volume gives the statistics for 1906. It is published earlier than usual, despite contents unusually voluminous, for there are 950 pages. Owing to the fact that editorial work on the volume closed in May, some of the statistics are incomplete, but they relate to minor matters, and it is held that the greater promptness of publication more than balances the lack of them. As usual there are many reviews and technological articles of permanent value, prepared by W. R. Ingalls, F. W. Parsons, Frederick Hobart, J. T. Glidden, Robert H. Richards, J. F. Kemp, and other authoritative writers. It is not necessary to emphasize the value of this publication, for it has become indispensable to those engaged in the various branches of mining. The editor, Mr. W. R. Ingalls, is to be congratulated on the timeliness, completeness, and excellence of the book. It is for sale for \$5 by the MINING AND SCIENTIFIC PRESS.

'Electricity in Mining,' by Sydney F. Walker. D. Van Nostrand Co., New York. 380 pages.

This is a comprehensive book written by an engineer engaged for 30 years in the practical application of electricity to mining work. Among the subjects treated are signals, telephones, and electric lighting apparatus in use about mines. A chapter is devoted to the generation of electricity economically; another to the principles and practice of the distribution of electricity as it is applicable to mining. The best electrical machinery used in mining is described and information is given whereby managers of mines may obtain an idea of the power required for different kinds of mining work; how that power should be delivered, and how they know when they have the proper amount. Another useful chapter is that in which are given a few simple rules for the discovery of causes of failure in electrical apparatus. The author says that he has in view "the possibility that the mine may be situated hundreds of miles from everywhere, that the engineer in charge of the apparatus may have only himself to depend upon, and that he may be obliged to depend upon rough and ready apparatus in order to keep things going." The book is well illustrated and ought to be most useful to mine engineers, superintendents, and managers.

For sale by the MINING AND SCIENTIFIC PRESS; price \$3.50.

Publications Received.

The General Index to the Publications of the California State Mining Bureau has just been issued. This is a most valuable bulletin of the contents of the large number of reports, bulletins, and maps that have been published. It is listed as Bulletin No. 46, and was compiled under the direction of State Mineralogist Lewis E. Aubury.

'The Land of Sunshine' is the title of an attractive handbook of 446 pages, describing the resources, products, industries, and climate of New Mexico, and compiled by Max Frost and Paul A. F. Walter. The book is handsomely illustrated and contains chapters on the geography, geology, and mineral resources of the Territory. Published by the New Mexico Bureau of Immigration.

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TABLE OF CONTENTS

Editorial:	Page.
Notes.....	285
Lost Bullion Spanish Mines.....	286
By the Way	287
General Mining News	289
Special Correspondence	294
Mexico City.....	Butte, Montana
Johannesburg, Transvaal.....	Salt Lake, Utah
Calumet, Michigan.....	Cripple Creek, Colorado
Concentrates	299
Discussion:	
A Fundamental Problem.....	North Star 300
Ore Deposition.....	Walter E. Koch 300
Testing Mill-Talling.....	Wilton E. Darrow 300
An Engineer's Guarantee.....	B. M. 301
Articles:	
Hydraulic Mining in Cariboo.....	Douglas Waterman 302
The Electric Age.....	Horace J. Stevens 304
Metallic Sulphides in the Tufts of Santo Domingo.....	F. Lynwood Garrison 305
Arbitration: Compulsory and Voluntary.....	311
A Magnetite Separator.....	314
Compressed Air Hose Connections.....	314
Mining and Metallurgical Patents	313
The Prospector	310
Departments:	
Personal.....	288
Obituary.....	288
Market Reports.....	288
Dividends.....	288
Books Received.....	314
Catalogues Received.....	314

Editorial.

ALTHOUGH the statement that Mr. Roosevelt intended to become editor of the New York *Tribune* was unauthorized and untrue, it does not seem wholly preposterous. When we think of the influence that a big paper edited by a man of Mr. Roosevelt's character and energy could have on the thought of the country, we regret that it is not among the probabilities. It has been said, also without authority, that the President of the United States might become President of Harvard University, and to be the successor of Mr. Charles W. Eliot is an honor second to none, not even the Presidency of America. Nevertheless, we are of the opinion that a forceful man of high character and wide experience in public affairs could make a daily paper a greater educating medium than any university in existence.

COPPER is weakening and copper mining shares are depressed. In consequence, several small mines have been shut down and the operations of the larger companies are curtailed. It is stated that the Amalgamated Company sold a large consignment of copper at 15 cents, and that producers are timid. Certainly, buyers have been withholding their orders and as production continues there will be an accumulation of stock, endangering the stability of the market. It is likely that copper will be very weak for a while, but there is every reason to feel confident as to the future. Industrial depression will have to be severe and world-wide before the market can stay at anything like 15 cents. We expect to see the metal again at between 20 and 25 cents, that is, in the course of a year or so, after a period of unsteadiness. In the meanwhile copper that costs anywhere near 15 cents to produce had better be kept underground.

THE SCHOLARLY ARTICLE by Mr. F. Lynwood Garrison will be appreciated by mining geologists. In the course of his description of the occurrence of metallic sulphides in the tufts of Santo Domingo, he refers to similar occurrences elsewhere and draws attention to a type of ore deposit that is well worthy of closer study. Some of our geological friends could contribute supplementary observations and we hope that they will do so. It is likely that portions of the San Juan formation, consisting of tuff and breccia, in southwestern Colorado, were laid down in water, that is to say, the volcanic dust dropped into a lake and when consolidated became a rock the origin of which, therefore, was in part volcanic and in part sedimentary. The present writer remembers seeing a piece of rhyolite containing fossils, and thus eminently suited to deceive an unwary petrographer. It came from Nevada, and consisted of the

fine product of explosive volcanic energy that had fallen into water and had become consolidated under conditions permitting of the enclosure of plant remains. The successful exploitation of ore deposits in the consolidated tuffs of Colorado and Nevada adds another to the many rocks in which gold is found.

HYDRAULIC MINING is not as important a branch of gold mining as it was a few years ago, but in certain localities it continues to exemplify the effects of geological action in the past and of human activity in the present. At Cariboo, in British Columbia, a former channel of the Quesnelle river is being mined close to the existing river-bed, the two channels being separated by a narrow rim of rock. Mr. Douglas Waterman contributes an excellent description of the deposit and the manner in which it is being mined. Incidentally, mention must be made of Mr. J. B. Hobson, the engineer under whose skillful management the Consolidated Cariboo Hydraulic Mining Company has been enabled to operate so successfully.

Lost Bullion Spanish Mines.

THE STORY told in a court of law at Denver proves the Lost Bullion Spanish Mining Company to have been an imposture of the worst kind. Last week, by the verdict of a jury, eleven men were found guilty of a conspiracy to use the United States mails for fraud. Several of the defendants, at least two of them, were mining engineers in good standing, and to them conviction is an indelible disgrace, removing them from the ranks of the reputable members of the profession. The case was brought to trial by the Post-Office Inspectors and among the chief witnesses for the prosecution was Mr. Waldemar Lindgren, whose services were loaned by the Geological Survey to the Post-Office Department.

Briefly, a prospector named Du Bois claimed to be the discoverer of an ancient Spanish mine, first found by an aged Yaqui Indian. It was stated that big quantities of silver had been taken from these cavernous workings by the Spaniards before an Indian uprising had driven them from the country. To bolster this yarn, the promoters engaged mining engineers to make a pretended investigation and to certify as to the amount of ore available. A confession obtained by the postal inspectors from Du Bois punctured the soapy film of falsehood. It was proved that in the preparation of their glowing prospectus, the promoters hired a newspaper man named Lindsey, who used large patches of Prescott's history to heighten the interest of the descriptive matter distributed through the mail. The deed transferring the property proved to be in a fictitious name. A mining engineer testified that his report had been garbled and his samples doctored. Another, whose name it is a pleasure to mention—Henry Edwards—was asked to act as consulting engineer; he went to the alleged mine and refused to make an examination. Among those convicted, one mining engineer "was tired of making examinations for other people" and preferred a large block of stock. He

demanding and obtained 200,000 shares, which proved his undoing. For the sake of giving them a market value, he lied. To raise \$50,000, the sum of \$5,000 was spent in publishing the same kind of alluring statements and pseudo-scientific bunkum that anyone can read in dozens of newspapers today or tomorrow, especially in the Sunday editions of big dailies and on the advertising pages of religious papers.

When the agents of the Post-Office Department went to the alleged ancient mine, they found a large natural cave in limestone and they also discovered a big fraud. In order to get scientific opinion as to the nature of the hole, Mr. Lindgren was requested to make an examination, the result of which was conclusive. To combat this testimony the defence engaged a Professor Lindermann as an expert witness; he talked a lot of balderdash about stalactites and lime formations, all in the sort of language that parodies science and blooms on the pages of prospectuses designed for the illiterate. To prove the absurdity of this 'professor's' statements, our friend Mr. Philip Argall was put on the stand. Thus in the end the whole tissue of absurd lies was swept aside, with the result that the jury found all the perpetrators guilty.

We have told the story at some length because it exhibits a phase of mining that cannot be too clearly exposed.

Of course, this is not business but cheating; nevertheless, there is much of the same sort of thing in progress at the present time, and it is an inevitable concomitant of speculative excitement such as has marked the past two years. 'Ancient workings' and 'lost mines' are nothing new; they have been used over and over again by irresponsible schemers. We read in the Australian papers just to hand that the Big Hole Exploitation Syndicate secured \$50,000 from "prominent city men" in New South Wales by representing a strange excavation in sandstone as an abandoned mine. The very name 'Lost Bullion Spanish Mines' is eloquent of deception and the flamboyant twaddle of the prospectus should have been a warning also.

But what of the mining engineers that lent their names and that of an honorable profession to this wretched swindle? The public has a right to speak bitterly of men who, under the pretense of being skillful geologists and experienced miners, sell themselves to the predatory promoter. We hope that this case will be a warning to others tempted to take stock in mining companies instead of regular fees; that way lies the road to perdition. Avoid contingent fees as you would a direct bribe, for they undermine professional integrity and excite the cupidity of which none of us is wholly devoid. One more comment may be made: We wish that the postal authorities would publish the names of the newspapers and periodicals, some of them posing as advisors to investors, that accepted the advertisement of the National Securities Company—a beautiful name for the purpose—and the Lost Bullion Spanish Mines Company. These advertisements were lures on the very face of them; that is, anyone having the least knowledge of mining could detect them. Knavery of this kind is made easy by the prostitution of the press.

By the Way.

In a recent issue of *The Evening Post*, New York, we find the following interesting account of the Hawaiian volcanoes:

To make the ascent of Haleakala one must go by train along the coast from Kahului to Paia and there take carriage to the Haleakala ranch, which lies in the foothills at the base of the great mountain. From here it is a 10-mile ride over a winding rough trail up the side of the mountain to the summit. All the lower stretches of the mountain are covered with green, and thousands of cattle find pasturage on the hillsides. The land is broken with deep gulches, marking old lava flows, and the horses pick their way gingerly over the slippery footing. As one rises, the outlook is superb. On the level isthmus connecting the two halves of the island, the cane fields are seen marked off like a checker-board. Beyond the white line of surf and the curved beaches, the waters of the Pacific stretch away to the horizon. We reached the ranch house at Olinda at 4 o'clock in the afternoon, after riding for an hour through a blinding rainstorm. Two hours later, within three miles of the summit, we saw a sunset more than a thousand feet above the clouds. The sides of the mountain were bare and covered with broken stones, old lava runs, and bits of broken dried wood where once scrubby undersized trees had grown.

It was 8 o'clock and pitch dark before we reached the edge of the crater. We only knew it was the summit because the horses refused to go any farther. They had walked to within a couple of yards of the crater walls, which drop sheer down 2,500 ft. The last hour of the journey we could not see five feet beyond the horses' heads, and depended wholly upon the sagacious sure-footed animals to find their own way; they kept the trail unerringly.

That night it was so cold on the summit that, although we had tents and blankets, we found it impossible to sleep comfortably, and spent the entire night seated around a fire, swathed in blankets and sweaters. The night was as still as it was cold and clear. The sunrise the next morning was a gorgeous effect. The crater of Haleakala has a circumference of 20 miles and an area of 19 square miles. A score of cones from 300 to 1,000 ft. in height dot the floor, while from out the one-time cauldron lead two gaps, once the vents of lava flows which cover the eastern and southern flanks of the mountains. The impression is one of rare desolation and grandeur.

The active crater of Kilauea, on the side of Mauna Loa, is one of the most comfortable volcanoes to visit. One may do it in white canvas shoes with perfect ease. There is a fairly well appointed hotel on the edge of the crater, and one may easily walk in an hour the three miles from the top of the crater's edge to the smoking pit, Halemaumau.

Active volcanoes exist on the island of Hawaii, but even tradition gives no account of any elsewhere in the group. And on Hawaii, volcanic activity has been confined, within modern times, to the summit and slopes of Mauna Loa, with the exception of an eruption of Mount Hualalai in the year 1801. Eruption in the crater of Kilauea at 4,000 ft. elevation, and in that of Mokuaweoweo, at the summit of the great mountain, 13,675 ft. high, together with flows of lava from points about the periphery near the summit, all occurring at irregular intervals of years, constitute the lively features of Hawaiian volcanic phenomena. The people of the island have not the slightest fear of their volcanoes. The mountains of the island are so large and the flow of lava is so sluggish after it has been moved some distance, that peo-

ple in any of the inhabited parts of the island could hardly be taken by surprise by an invasion of the molten rock.

Records are extant of more than a score of eruptions upon Mauna Loa in the nineteenth century. The lava flows came from various points near the summit, and some of them lasted many months. One in 1887 and another in 1899 made magnificent displays, which were easily and safely accessible to view at short range, and drew large numbers of spectators from all over the islands. On such occasions steamboat excursions to the nearest landing are always hastily organized, so that the scene may be witnessed before it becomes played out.

The flow of 1887 continued for more than a fortnight, down the slopes, 30 miles to the sea. In places the fiery stream spread out to a mile's width, and, passing over abrupt declivities, formed cascades of flaming debris. Fire fountains played all along the moving mass. This eruption, within the seventeen days that the flow lasted, was signalized by nearly 400 earthquake shocks, none of which did heavy damage.

The flow of 1899 started, by a peculiar coincidence, on the second Fourth of July after the annexation of Hawaii and continued for three weeks. Those fortunate enough to get within near view of the diversified manifestations, which involved some arduous mountain climbing, were fully rewarded. The eruption, according to guesses made by observers, appears to have started within 3,000 ft. from the summit, but eruptive cones of great size developed at various distances farther down for two or three miles. Some of these were mighty fountains, throwing not only fused material, but huge boulders, to a height of 50 ft. At the highest vent the eruption formed a crater, which assumed the form of a mound 150 ft. high, over the rim of which four streams of lava poured to merge at the base. A curious development in a lava flow is that as it takes its way it forms a tunnel of congealing crust through which the purely fluid matter runs for a long distance concealed. Here and there along the route the accumulated gases produce minor eruptions, causing fire fountains. In the last-mentioned flow there would be visible at once from a single point of view several of these eruption cones, ranging from 100 to 300 ft. in height.

Kilauea forms a cavity in the mountain-side with walls on three sides from 300 to 400 ft. high. Its area is about four square miles; circumference, 7.85 miles; extreme length, 2.93 miles; extreme width, 1.95 miles. The principal focus of activity is near the middle of the main crater—or what Captain Dutton, who wrote a scientific report on Hawaiian volcanoes for the United States Government in 1884, conveniently called the caldera, to distinguish it from the eruptive vents within its confines. Halemaumau, meaning the house of fire, is the name given to the principal cone, whose interior in periods of high activity constitutes a lake of molten lava.

In the intervals between the more violent periods of Kilauea, lasting sometimes for years, intense heat is retained in all of the lava vents as well as throughout miles of fissures, extending in various directions upon the floor of the caldera. Any inflammable material exposed to these openings takes only a few moments to become scorched or ignited. Odd formations of lava are found all over the floor, including the caves and bridges, within or under which the spaces are large enough to shelter a crowd. One particular cavern is a vault-shaped place entered through a hole broken in its roof. It is ten feet deep and about fifteen feet each way laterally, and its temperature is usually so high that few can remain inside it more than a few minutes.

Personal.

E. W. PARKER is in San Francisco.

F. L. BOSQUI has returned from Tonopah.

JAS. W. ABBOTT, of Pioche, is in San Francisco.

W. B. MILLIKEN is in Denver, on a visit from Nevada.

S. V. TRENT, of Salt Lake City, was in Denver recently.

J. A. AIVERETT is examining mines near Parral, Mexico.

J. V. N. DORR, of Denver, is at Deadwood, South Dakota.

T. BRUCE MARRIOTT is examining copper mines in Norway.

W. DE L. BENEDICT is expected in San Francisco during October.

F. B. REECE is spending a short time at his home near Liverpool.

FRANK A. KEITH, of the Montana-Tonopah mine, is on a visit here.

L. HUNDESHAGEN has left London on his way to the west coast of Sumatra.

H. DE C. RICHARDS has been inspecting mines near Deadwood, South Dakota.

W. E. WAINWRIGHT is manager of the Broken Hill South mine, in New South Wales.

E. E. BENJAMIN has returned to San Francisco from the examination of mines in Idaho.

J. P. SIDWELL has returned to Chicago from a visit to the Atlas mine, at Ouray, Colorado.

JAMES E. HYSLOP is manager for the new owners of the Palmilla mine, at Parral, Mexico.

MILNOR ROBERTS is superintendent for the Alaska Galena Co. near Ketchikan, Alaska.

L. H. GREENE, who has been operating in Humboldt county, Nevada, is now at Berkeley.

NORMAN CARMICHAEL, of the Arizona Copper Co., is in San Francisco from Morenci, Arizona.

OSCAR A. ANDERSON has been appointed instructor in the Dakota School of Mines, at Rapid City.

T. B. GREENFIELD has been appointed assistant engineer at the Yusspensky mine, in Central Siberia.

CHARLES L. POINDEXTER is manager for the Cia. Minera de Oro de Guarisamey, in Durango, Mexico.

H. A. SHIPMAN has been appointed consulting engineer for the United Rico Mines Co. of Rico, Colorado.

WILLIAM CAMPBELL has been promoted to an adjunct professorship of metallurgy in Columbia University.

FRANCIS W. BOSCO, mill manager for the Great Mogul Mining Co., has returned to Denver from New York.

JUNUS W. JOHNSON and HERBERT C. ENOS have opened offices at the Iturbide Hotel, Mexico City, as consulting mining engineers.

L. M. TERRY was held up and shot in the leg near Sta. Eulalia on August 16. The wound was not severe, and he is recovering rapidly.

ARTHUR S. EAKLE, professor of mineralogy in the University of California, has returned from an interesting geological reconnaissance in Alaska.

W. G. ANDERSON, formerly mine superintendent for the Dolores Mines, Ltd., in Chihuahua, is now manager for the Iona Gold Mining Co., at Smuggler, Colorado.

Obituary.

COMMODORE PERRY CRAWFORD died at Santa Rita, near Silver City, New Mexico, August 23, 1907. Owing to a mis-step, he fell into a shaft and was instantly killed. Mr. Crawford has been associated in the development of the Southwest for the last forty years, through merchandising, banking, and mining. He was a man of ability and unquestioned integrity, and one whose active and practical sympathy and kindly manner will be remembered by many, and whose loss will be keenly felt by all who knew

him. Mr. Crawford was born near East Liverpool, Ohio, in 1845. He enlisted in the Union army at the commencement of the war, at the age of seventeen, and served with honor until mustered out after Lee's surrender, taking part at Harper's Ferry in the siege of Vicksburg, and in Sherman's campaign. His body was fitly shrouded in the stars and stripes—for the long hard battle, especially of his later years, was done; and he had earned his parole. He leaves a wife, a son, in his senior year at the University of California, and six daughters.

Latest Market Reports.

LOCAL METAL PRICES—Sept. 5.

Antimony.....	17.00@20.00c	Quicksilver (flask).....	\$38@39.50
Copper.....	24.00@25.00c	Spelter.....	7.00@ 7.75c
Pig Lead.....	5.35@ 6.30c	Tin.....	\$2.50@44.00c

ANGLO-AMERICAN SHARES.

Cabled from London.

	Aug. 28.	Sept. 4.
	£ s. d.	£ s. d.
Camp Bird.....	0 19 3	0 19 6
El Oro.....	1 5 0	1 5 0
Esperanza.....	2 0 9	2 0 6
Dolores.....	1 5 0	1 5 0
Oroville Dredging.....	0 16 6	0 16 6
Stratton's Independence.....	0 2 6	0 2 6
Tomboy.....	1 8 9	1 8 9

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

COMSTOCK SHARES. SAN FRANCISCO.

Closing Prices.

Sept. 4.

Closing Prices.

Sept. 4.

Alpha.....	08	Julla.....	07
Andes.....	22	Kentuck.....	
Belcher.....	24	Mexican.....	57
Best & Belcher.....	90	North Gould & Curry.....	16
Bullion.....	19	Occidental.....	21
Caledonia.....	31	Ophir.....	1.07
Challenge Con.....	20	Overman.....	14
Chollar.....	31	Savage.....	96
Confidence.....	95	Scorpion.....	07
Con. Virginia.....	81	Sierra Nevada.....	47
Crown Point.....	34	Silver Hill.....	41
Exchequer.....	39	Standard Con.....	2.00
Gould & Curry.....	31	Union Con.....	44
Hale & Norcross.....	1.20	Yellow Jacket.....	1.22

CALIFORNIA—Closing Quotations, Sept. 4.

Southern Belle.....	38
Bunker Hill.....	2.50

SOUTHERN NEVADA STOCKS.

San Francisco, Sept. 5.

Atlanta.....	\$ 53	Laguna.....	1.50
Belmont.....	2.95	Little Tonopah.....	1.00
Columbia Mtn.....	50	Manhattan Con.....	40
Combination Fraction.....	2.30	Midway.....	73
Daisy.....	1.60	Mizpah Extension.....	20
Fairview Eagle.....	1.57	Mohawk.....	19.75
Florence.....	4.90	Montana Tonopah.....	3.00
Gold Bar (Bullfrog).....	55	Nevada Hills.....	5.10
Gold Bar (Goldfield).....	50	Red Top.....	3.75
Goldfield Con.....	7.60	Sandstorm.....	46
Goldfield of Nevada.....	1.35	Silver Pick.....	56
Gold Kewanas.....	70	St. Ives.....	88
Great Bend.....	70	Tonopah Extension.....	1.45
Jhm Butler.....	82	Tonopah of Nevada.....	12.00
Jumbo.....	3.75	Tramp Con.....	36
Jumbo Extension.....	1.80	West End.....	68

(By courtesy of W. C. Ralston, 368 Bush St.)

COPPER SHARES—BOSTON.

Closing prices.

Sept. 5.

Closing prices.

Sept. 5.

Name of company.	Sept. 5.	Name of company.	Sept. 5.
Adventure.....	21½	Michigan.....	12
Ahmeek.....	60	Mohawk.....	69¾
Allouez.....	33	Nevada Con.....	10½
Amalgamated.....	73	North Butte.....	66
Arcadian.....	4¾	Old Dominion.....	23¾
Atlantic.....	13	Oscoda.....	106
Balaklala.....	7¼	Parrot.....	14½
Bingham Con.....	11½	Phoenix.....	1
Boston Con.....	22¾	Quincy.....	88½
Butte Coalition.....	20	Raven.....	1¼
Calumet & Arizona.....	146	Rhode Island.....	4
Calumet & Hecla.....	700	Santa Fe.....	2½
Centennial.....	22	Shannon.....	14¾
Con. Mercur.....	40	Superior & Pittsburg.....	13¾
Copper Range.....	66¾	Tamarack.....	73
Daly-West.....	13¼	Trinity.....	167½
Franklin.....	10	United Copper com.....	52½
Granby.....	100	Utah Copper.....	43½
Greene-Canaan, etc.....	11¾	Victoria.....	57½
Isle Royal.....	18¼	Winona.....	7¾
Mass.....	4½	Wolverine.....	143

(By courtesy of E. F. Hutton & Co., 490 California St.)

General Mining News.

ALASKA.

News has been received in Ketchikan of a good strike on the Julia group in Yankee basin, at the end of an 800-ft. tunnel, 450 ft. below the surface. This property is under bond to John G. Heid for \$60,000, the bond expiring November 1.—Work has been temporarily suspended at the Sea Island property.—Sam Gourlay has taken a contract to drive the lower tunnel in Beaver Mtn. for the Sultana company.—Twenty-seven men are working at the Moonshine property on Prince of Wales island, under Milnor Roberts.

ARIZONA.

COCHISE COUNTY.

Work on the North Bisbee Development Co.'s property in Tombstone canyon has been temporarily suspended, to retimber the shaft.—The Shattuck-Arizona continues to produce 400 tons per day, and work is progressing on the 900-ft. level. The winze on the Leo claim, 800-ft. level, is still showing good ore.—The shipments from the Denn-Arizona average about 50 tons per day, coming principally from the 1,100-ft. level. A station will be cut at the 1,200-ft. level.—A force of miners has been put to work on the new discovery made by William Fourr, 20 miles west of Benson, and are sinking a shaft in ore. Lead ore has been discovered and opened between 30 and 40 ft. deep in that vicinity, and the lead carbonate region there is known to be about two miles square.—A strike made by the owners of the Scherer property recently, at a depth of 45 ft., of sulphide ore that assayed from 30 to 35% copper, has caused excitement this week. This property was bought by San Francisco parties some five weeks ago. Emile Allen is manager. They have shipped two carloads of ore already to the Copper Queen smelter at Douglas, and have about two carloads more on the dump. On account of the judgment given in the district court an order of sale has been made of the property of the Cochise Consolidated Copper Co., in the California mining district, in the vicinity of Paradise. The judgment was rendered in favor of Madison L. Larkin of Scranton, Pa., who held a trust deed for the property to secure a loan in the sum of \$22,000. The property of the company that is to be sold consists of a group of 13 claims, located in the heart of Paradise district, and is said to be one of the best groups in that district.

GILA COUNTY.

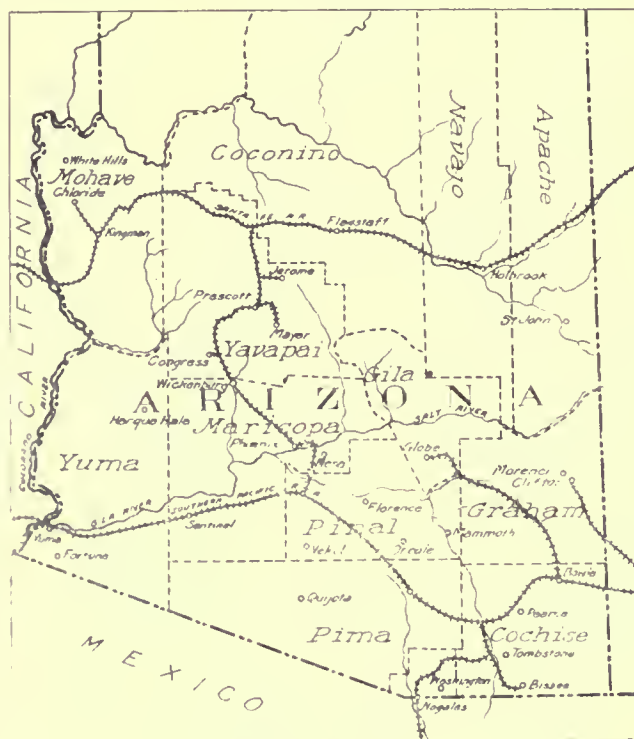
(Special Correspondence).—A good strike has been made on the property of the Superior & Boston Co., at Globe. Rich copper carbonate ore has been uncovered in the 335-ft. level of the Limestone shaft. The ore is similar to that found on the Black Oxide and Great Eastern claims and other properties of the district. The most encouraging developments on the group of claims belonging to the company are in the Black Oxide, where some 7% ore has been found. Indications point to a continuation of the high-grade ore, and the deposits show no signs of giving out. The company is erecting two lines, one at the mine and the other on the Arizona-Commercial railroad. The Great Eastern shaft is down 335 ft. and will be sunk 125 ft. more to the water-level.—The Old Dominion company should make a record production of copper, the present daily average output of the smelter being 450 tons.—A large amount of ore is being hoisted, and good progress is being made in development and construction work. The big winze is going down steadily, and by October 1 it will be completed to the 16th level. Coke and other supplies are arriving, assuring continuance of the present activity and prosperous times for Globe. No. 5 cross-cut west on the 14th level has encountered sulphide ore of about the same grade as at other points on this level, going about 10% copper. The new cross-cut is being driven slowly on account of the ground being heavy and wet, requiring careful timbering. The sulphide vein on the 14th level has now been partially opened by cross-cuts and drifts to a total length of 800 ft., the ore running well and having an extreme width of 80 ft. The average copper

value is about 10%, and in the west stopes and drifts shows an increasing percentage of sulphur so essential to the converter process of smelting. The winze will reach the 16th level at a depth of 1,235 ft., where it is expected the ore-shoot will be found to be wider even than it is on the 14th level, and to carry more sulphur in the ore.

Prescott, Sept. 1.

MARICOPA COUNTY.

Franklin W. Smith has recently reported on the property of the Southwestern Development Co. for the Phelps-Dodge people, and money has been raised for the development of the property, work on which will be resumed at once. The ore in this mine has some tellurium, which was not discovered until a short time ago. The orebody is large and the average value is good, and with proper management it should make a mine.—A plant for the treatment of low-grade copper ores is now in operation, reducing the ores of



Map of Arizona.

Cornelia Copper Co. at Ajo, 50 miles south of Gila Bend. It is known as the Anderson process and the plant is producing copper direct from the ore at a low cost. Edward L. Anderson, the inventor, is supervising the plant at Ajo. These people expect to erect a plant that will produce 2,000 lb. copper per day. The capacity of the present plant is 400 lb. per day.—Hoisting machinery has been ordered for the Greenstone mine, which is showing up well as development progresses. At the bottom of a 60-ft. shaft is a 60-ft. cross-cut, and driving along the vein each way is being done. In these drifts, each of which is 20 ft. in, there is some ore.

PINAL COUNTY.

Thos. Haley recently paid \$40,000 for interest in the Calumet mine on Mineral creek. Thos. F. Weedon of Florence negotiated the sale, and the Consolidated Big Lead and Calumet Mining Co. are the purchasers, and they will do extensive improvement.—J. H. McCabe has acquired 27 claims, including the Silver King mine, in addition to several millsites. The smelter at Price station on the Southern Pacific railroad is also owned by McCabe and associates. It is the intention to concentrate ore from the numerous mines of the group and operate them in connection with the smelter, which will also receive custom ores. The present metallurgical plant comprises a complete sampling works and a 20-ton stack, built originally for experimental purposes. A 250-ton stack is to be built to treat a large tonnage of custom ores.—W. V. Elliott, superintendent of the Wessell Copper M. & M. Co., is working six men on the

American Boy mine, situated about two miles north of Toltec, on the Southern Pacific railway. The workings at present are 100 ft. deep, the sinking being carried on for the purpose of catching the vein that shows in several other workings on the property. The American Girl, another of this company's properties, is an extension of the American Boy and carries approximately the same ore. The formation is schist and porphyry with large firm rhyolite dikes crossing it. They also have 12 claims on Arizola Mtn., which are close to the railroad and are showing up well. The Wessell Copper M. & M. Co. is composed of St. Louis capitalists and mining men who organized last winter to take over these properties after thoroughly investigating them. Vanadium has been found in a vein on claims six miles from Kelvin, belonging to Platt & Foss.

It is thought that the reorganization of the Troy-Manhattan company will soon be effected. The terms are that the men who will have control of the new company are to spend \$750,000 in development work and machinery, in return for which they will receive 60% of the stock of the old company.

YAVAPAI COUNTY.

The 160-ft. shaft of the Treasure Vault mine has been wrecked by the excessive amount of water, due to the heavy rains, which formed a torrent that swept down on the shaft, overturning the water-tank, and tore away the timbers in the shaft, carrying them to the bottom in a hopeless mass of wreckage. The whim narrowly escaped being carried to the bottom by the water. Some of the richest gold ore mined in the district was taken from the Treasure Vault. It is owned by John Daly of Crown King and R. H. Row of Prescott. The shaft will have to be entirely re-timbered.—W. H. Knight, president and general manager of the Knight Copper Co., is enthused over a strike of manganese ore made in the new working shaft on the Owl group of mines, about three-quarters of a mile south of Humboldt. The orebody, which was struck at a depth of 10 ft. in the shaft, is 4 ft. thick.

VUMA COUNTY.

Thomas Finnegan will have charge of the development of the Copper Whale group of claims, near the Victor and Bell Crown. A contract will be let for a 100-ft. shaft. New York and Los Angeles people are interested in the company.—A. E. Wiley of Los Angeles has been examining properties in the Tank Pass district.—E. A. Haggott is examining the Ironwood & Arizona property, and will advise as to new development work. The shaft is down about 300 ft. and 15 men are employed.—The Victor and Bell Crown shaft is down 250 ft., having been put down under contract by Andreas Olivares.—Development work on the Harecuvar Copper Co.'s property, near the Ora Cobre, has been started, being financed by Philadelphia capitalists.—Work has started at the Hercules property, after a two months' shut-down. This mine is near Salome and gold ore has been struck.—W. C. Price of Los Angeles has purchased six copper claims in the Silver district from Mrs. T. M. Hart of Cibola, the price being \$10,000.

CALIFORNIA.

CALAVERAS COUNTY.

Good reports of the Hamby mine, near Golden Gate, operated by the Viking Gold M. Co., are brought by C. E. Engstrom. Ten stamps are dropping, the ore being stoped from the 200-ft. point. The shaft will be sunk 100 ft. farther, and ten more stamps will be added. Eighteen men are employed.

NEVADA COUNTY.

The London Exploration Co., represented by Charles A. Derby, will pump out the Independence mine, on Wolf creek, near the lower Plumbago mill, in order to examine it. An incline is down 180 ft., and a vein is supposed to be showing in the bottom.—A good many improvements will be made in the equipment of the Ironclad, including a 10-stamp mill, a three-compartment shaft, and a 16-in. Cornish pump. Several unsuccessful attempts have been made to keep the water out of the workings with an inadequate pumping plant.—An important strike has been made in the California mine, on Deadman's Flat, where a

vein of good milling ore has been discovered in a 25-ft. raise from the south drift. The shaft is 250 ft. deep. Grass Valley people own the controlling interest in the company.—All the mines closed for Labor Day, throughout the district.—A company will take over and develop the Young America group of claims at French Corral.—The shoot recently struck in the Ethel continues to look well and the company is trying to acquire contiguous ground.—The Marcotte mill will be crushing within a month, and the five stamps on the Williamson are already dropping.—J. O. Jones, in charge of the small crew working at the Old Channel gravel mine at Blue Tent, will not concede the 8-hr. day demanded by the men who recently walked out.—J. C. Nash and John Meyers are making another examination of dredging ground at Greenhorn and the country around You Bet.—Some rich ore has been brought to Grass Valley from the Morning Star mine, which the James brothers are developing on Randolph flat. The rock came from the bottom of a 125-ft. shaft.—The vein at the Delhi mine is looking well, and the water supply is now adequate, as the second ditch from Bloody Run has been finished. Hamilton Eddie is the superintendent.—The Pittsburg Standard M. Co. will build a 5-stamp mill at the Norambagua mine, to be used in testing ore taken out in the process of development.

SHASTA COUNTY.

A statement is credited to Paul Heroult to the effect that the electrical furnace on the Pit river will not turn out any more pig iron, as at \$30 per ton there is not much profit in it. Instead, the furnaces will be run continuously making ferro-silicon, for which a higher price can be secured from the steel-casting plants. As soon as the railroad is completed past the smelter, which will be in about three months, pig iron will again be produced.—The No. 1 furnace at Kennett has been shut down for extensive repairs and alterations. It will be changed to a water-jacket-top furnace.

SIERRA COUNTY.

(Special Correspondence).—The lower cross-cut tunnel in the Tightner is being driven steadily ahead. The rock has softened during the last 50 ft., and more rapid progress is being made. Ore is being extracted from the main vein.—Work has been resumed on the Oriental, but the scarcity of men is retarding operations.—The rich strike recently made in the Rainbow is improving with development. Milling ore is being blocked out.—The Do-eile has been reopened by J. Freeborough, and will be systematically developed.—Construction work is under way at the Red Star. Underground operations will be resumed when winter starts.—A South Dakota company will develop and operate the Yellow Jacket group of quartz claims. Several promising veins have been exposed in prospecting the claims.—The Alma Mater group has been bonded by Oakland parties and will be developed at once. The claims contain rich quartz, and are situated on Wolf creek.

Alleghany, Aug. 31.

TRINITY COUNTY.

The Dorleska mill has started, treating ore taken out by lessees; five stamps will be kept dropping for some time. This property is at an elevation of about 7,000 ft.—It is thought that the first furnace at the Balaklala smelter will be blown in about December 1. The plant is nearly completed; three furnaces are in place, the 250-ft. smokestack is done, and the cables are being stretched on the towers of the aerial tramway. The four furnaces will handle 2,200 tons of material per day.

TUOLUMNE COUNTY.

The strike in the Omega mines continues to attract attention, as the ore is holding well. The rich shoot was struck in a cross-cut on the 300-ft. level. This property is on the west side of Table Mtn., two miles from Jamestown, not far from the old Rawhide mine. C. W. Ayers is the superintendent and a large shareholder.—Richard Sutton is in communication with Eastern people, to whom he expects to sell the Pereira mine. They will make an examination

of the property next month.—The App, Shawmut, and Jumper mills are running steadily.—Some good ore from the old Spring Gulch mine near Hunter canyon is on exhibition in Tuolumne. The Soulsby and Confidence, also on the east belt, are showing some good ore.—The Dreisam property is being cleaned out, preparatory to starting up.—The Gross mine at Tuttletown, owned by Fred Sutton of Sonora, is being worked under lease by Phil Rowe.—The Red Hill mine on Bald Mtn. has been unwatered and the 100-ft. level cleaned out. A five-year lease on the property has been given to Simon Hummel and Jim Kerr, by William Lewis.

COLORADO.

CLEAR CREEK COUNTY.

(Special Correspondence).—An important strike of silver-lead ore has been made in the adit in the Mary Ann mine. The vein is 16 in. wide and assays well.—Ore is being extracted from the Tobin, and is being developed on the six main levels; 200 tons of high-grade rock is sacked for shipment to the Denver smelter, while the lower grade material is being handled at the Wilcox mill.—A body of ore carrying gray copper and silver has been struck

ore.—Work has been resumed in the Mohawk tunnel of the Georgetown district, recently purchased by the Accord M. & M. Co. This adit is in 760 ft. The Two American Sisters company will furnish the power. J. J. Cully is president and James A. Mears is secretary, both of New York City. This tunnel was started in the early seventies to tap the Choctaw ore, and other Saxon Mtn. properties.—Jerome Smith is manager for the Democrat Mtn. M. Co., which is confining its efforts principally to the Moline tunnel, where driving is being done on the Beecher and Boston lodes. The aerial tramway from the Moline tunnel has been repaired.—Some good ore has been uncovered on the Nab-of property on Columbian Mtn., near Silver creek. Two levels have been driven 1,300 ft. and bunchy ore has been exposed.—The Kalamazoo tunnel is being driven to cut the Snowdrift vein, and has about 100 ft. more to go. Caves in the tunnel have given a good deal of difficulty.

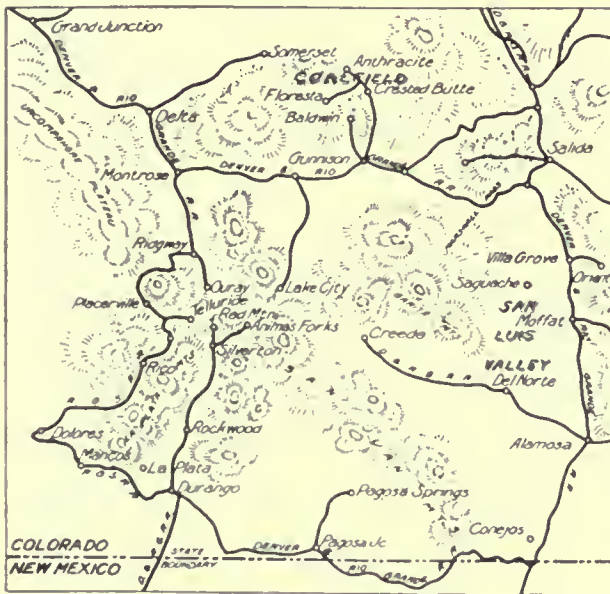
OURAY COUNTY.

(Special Correspondence).—The Atlas M. & M. Co. has recently increased its mill from 10 to 20 stamps, and will shortly increase to 40 stamps. The cross-cut tunnel is in 2,100 ft.; 425 ft. from the entrance they encountered the Crown Point vein and the Atlas vein 2,000 ft. in. These veins are being worked extensively. During the month of July they secured from the plates \$4,500, and \$4,000 worth of concentrates. The average assay values of the mine is \$13, and the pay-streak about 30 in. in width. It is estimated that with 20 stamps they will be able to mine and mill the ore under \$5 per ton, and with 40 stamps the milling cost will be 80c., and the mining cost not to exceed \$3.50 per ton; 4,200 ft. east of the Atlas claim and on the Atlas property the San Pedro tunnel opened up recently a silver vein at a depth of 1,200 ft. from the surface, three feet of ore averaging \$25 to \$30 per ton. J. P. Sidwell, of Chicago, is president.

Ouray, Aug. 30.

SAN JUAN COUNTY.

A decided shortage of miners is noticeable throughout the San Juan region, and the supply of laborers seems to be about exhausted.—Most of the mills in the region are running to full capacity. The Iowa mill is producing about a carload of concentrate per day, and the Green Mountain and Little Dora mills are running. The larger plants, including the Silver Lake, Gold King, Old Hundred, and Hamlet, are producing steadily; the Gold Prince will be dropping stamps as soon as some electrical machinery arrives, and the Mogul is only awaiting the arrival of a roaster.—Louis Resouches has driven a tunnel 110 ft. on his property and has recently encountered a strong vein.—The tunnel on the Wonderful group in Mill gulch, above Chattanooga, is in 1,500 ft., of which 1,100 ft. is on the vein. Streaks of high-grade material have been encountered at various points. T. Jay Hurley is the manager.—The Elsinore vein has been cut in the No. 5 tunnel of the Hamlet company at Middleton, 430 ft. below the surface. The ore contains lead, copper, and zinc, and the tunnel will be continued 750 ft. to the Hamlet vein. The mill is treating 75 tons of ore per day that is taken from the drifts, as no stoping is required to produce this amount. More than 7,000 ft. of driving has been done during the past year, under the management of William Lloyd.—E. C. Condit has taken a lease and bond on the Ariadne property, near Gladstone, in Cascade gulch, from Alfred Hies.—The shaft on the Molasses will be drained as soon as the present 300-ft. contract is completed.—Some good ore has been struck in the Gold Lake group of eight claims, owned by Louis Fritz and Al Rennis, in Spencer basin.—The tunnel of the Trilby Gold M. & M. Co., on King Solomon Mtn., is in 1,570 ft. and is expected to cut the main vein at about the 3,000-ft. point. A Rand compressor has been installed that will be operated by electric power. Martin Hauk is the superintendent.—Work has been resumed on the Senior Warden property, adjoining the Molasses mine on Sultan Mtn. The tunnel is in 500 ft. and the ore should be cut 300 ft. farther in. J. S. Herr is the manager.—The St. Paul, in the Red Mtn. district, now operated by the Ross M. & M. Co., has shipped another carload of copper ore.



Map of Southwestern Colorado.

in the lower levels of the Waukegan. The vein is 12 ft. wide. A small streak has also been found in the upper workings.—Work has been resumed on the Domingo group, and the lower cross-cut tunnel has been driven 400 ft. The company is being financed by Georgetown business men.—A vein averaging 11 in. wide has been struck in the Malen tunnel on the Scotia Mines group. The ore carries silver and lead, running about \$150 per ton.—A strike has been made in the North Star, on McClellan Mtn. At a depth of 200 ft. a four-inch vein running well in gold and silver, was struck. A body of ore has been struck in the adit on the Faurot lode, in the Delaware, 200 ft. from the portal. The vein is heavily mineralized and is four feet wide.—Good smelting ore has been encountered on the third level in the Bellevue-Hudson. The vein is seven feet wide. The mine will be operated by electricity, power being obtained from the Two American Sisters M. Co.—Considerable development work is under way in the American Sisters. In the Headlight shaft, the east drift from the 275-ft. level has opened up an 18-in. vein carrying silver. The mill is running on full time, and a large amount of lead, iron, and zinc concentrate is turned out.—Work will soon be resumed in driving the Golden Glory tunnel. The tunnel is expected to intersect some of the important veins of the district.

Georgetown, Aug. 15.

A strike of importance is reported in the Doric tunnel, on the Cram lode, 2,400 ft. from the portal. The ore comes from the back of the stope at this point, and carries gold, silver, lead, and zinc. Mill-test runs have been made on the

—A dozen men are engaged in sinking the 150-ft. shaft on the Iron Mask property in Maggie gulch, owned by the Intersection M. Co., for which J. E. Bowden is manager.

SUMMIT COUNTY.

The Silver Princess mine, one of the producers of the early days, is likely to soon excell all of its former records of production. Samples taken from one of the ore-shoots showed silver, lead, and zinc. High-grade milling ores are by no means infrequent in the Montezuma district, and the facilities for working them at a profit are soon to be at hand, if the recent activity of operators and large investors is to be regarded.—It is stated that the Kimberly-Wilfley mill at Kokomo is to furnish the model in a general way for the new Wellington mill, yet with important variations in some of the essential details. The special features of the Wellington mill will be close extraction and low costs. So thorough have been the tests that the Wellington officials are able to proceed with accurate knowledge of the nature of the milling requirements needed for their ores. The plant is to be situated on the eastern portion of the property, almost adjoining the property of the Reliance Dredging Co. This millsite is well selected, as a saving will be effected through the operation of a gravity tramway.

IDAHO.

SHOSHONE COUNTY.

The Missoula Copper M. Co. stockholders have voted to increase the capitalization to 1,500,000 shares of \$1 each. Robert McCormick reported that five stringers of copper ore have been struck, and a wagon-road built to the Independence tunnel so that machinery can be hauled to the property. An 8-drill compressor and motor will soon be installed.—The Snowstorm mill is treating 4,000 tons of ore per month, and 200 men are working at the mine. The new No. 4 tunnel is being driven 500 ft. vertically below No. 3.

NEVADA.

ESMERALDA COUNTY.

(Special Correspondence).—The tunnel on the Nevada Empress is in 900 ft. A winze has uncovered a four-foot orebody, and the company has decided to install a 10-stamp mill.—At the Goldfield Granite Mtn., the cross-cut tunnel is being driven to cut the vein at a depth of 500 ft. A second tunnel will soon be started.—The 450-ft. tunnel on the Richmond Gold Mtn. has cut out a body of lead and iron sulphide, containing \$15 per ton in gold. The 60-ft. shaft is in ore.—The shaft at the Nevada Frisbie is down 200 ft. in good ore. Several veins are being developed, and driving is under way.—The 10-stamp mill at the Bonnie Claire is running day and night on ore from the mine, but the highest grade is being shipped to Salt Lake for treatment. It is announced that the capacity of the mill will be doubled.—A large vein carrying some ore has been struck on the 800-ft. level in the Rattlesnake.—Some ore has been found in the May, and the vein is being developed.—The Oro Grande group is being developed by Rhyolite people. The lode is 12 ft. wide and the tunnel is in 110 ft.—The Blair group has been sampled by engineers representing Eastern parties.—The Wyman-Vyck Co. has secured a one-third interest in a group of copper claims near this point.—The Ohio-Linda Co. has decided to sink a shaft on Ohio No. 1, where some good ore has been found on the surface.—A vein containing gold, silver, and copper has been struck in the Rube Ryder group. Copper predominates with good silver values.—It is reported that a railroad will be built from this district to connect with the Las Vegas & Tonopah line.—At the Great Western much development work is being carried on, and an ore reserve is being blocked out.—The Lime Point continues to make a good showing with development.—At the Goldfield Mtn. quartz has been found containing wire gold. A tunnel is being driven to cut the lode at a depth of 600 feet.

Lida, Aug. 29.

LANDER COUNTY.

The shaft of the Reliance company's Little Gem mine is down 450 ft. on a 30° incline; 250 ft. of driving has been done on the 200-ft. level, 200 ft. on the 350-ft. level, and 100

ft. on the 400. John Tyree is the manager and Edward Cox is foreman.—The shaft of the Gold Quartz Co. is down 280 ft., and there is some milling ore on the dump. Copper indications come in about the 200-ft. point in the shaft.—Some good ore has been struck in the north drift on the 60-ft. level of the Bridal Wreath; four men are employed.—The Uncle Sam shaft is 65 ft. deep. F. E. Bowman is the manager.—An engineer has been examining the Bonanza group, now under bond to Schiele & Marion, for Salt Lake people.—The Silverside mine at Lander has recently been examined by several engineers.

LINCOLN COUNTY.

(Special Correspondence).—The incline shaft of the Nevada-Utah has attained a depth of 1,600 ft., and is still going down. Twenty-two other shafts and several cross-cuts have opened immense ore reserves. The company intends erecting a smelter near this city.—On the Prince, both shafts are below the 300-ft. level. In the bottom of No. 1, a cross-cut has uncovered a 40-ft. vein. The ore contains lead, silver, gold, and iron. The mine is equipped with a 40-hp. gasoline hoist and air-compressor.—Extensive development is under way at the Ohio-Kentucky. One shaft is down 310 ft., and another 340 ft. William Lloyd is superintendent.—The main shaft at the Last Chance is being sunk to the 500 level from the 250-ft. station. Some good ore has been encountered. E. F. Gordon is manager. Prospecting is going on at the Pioche X-Ray. Ore carrying silver, copper, and lead, and running \$15 per ton, has been found in the incline shaft.—A vein of fair-grade ore is being developed in the Mendha. The incline shaft is down 700 ft., and shipments of ore are being made to the Salt Lake smelter. The Nevada-Des Moines Co. is exploring the porphyry dike on its holdings. Good returns have been obtained from the outcroppings.—Simon Bamberger is preparing to sink a double compartment shaft on the Black and the Raymond & Ely veins. Good copper ore is being developed in the Bristol. Both shafts are in ore. Walter C. Brace is general manager.—The Ida May is being operated by W. A. Clarke, Jr. Some promising veins of low-grade copper ore are being developed.—At the Silver Horn group two parallel veins carrying silver, copper, and a small amount of gold, are being developed. The veins are about three feet wide.—The Southern Nevada M. & R. Co. has been organized to take over a group of 16 claims near this city. A small force will be engaged to develop the claims.—The building of the railroad has started a boom throughout this district, and it seems that Pioche will soon enjoy a measure of its oldtime prosperity, when it was one of the largest camps in the State.

Pioche, Aug. 19.

NYE COUNTY.

(Special Correspondence).—The Golden Anchor and Midway Extension have been consolidated, the former taking the property of the latter for 700,000 shares of its stock. The stock of the Golden Anchor has been increased from 1,000,000 to 2,000,000 shares: 170,000 shares of treasury stock will be put on the market at 20c. per share, for the purpose of paying off indebtedness and developing the properties.—It is reported that a large ore-shoot has been struck in the Belmont.—The outside districts, tributary to this city, are lively.—In the Bellehellen section 16 properties are being developed. On the Poles excellent ore is being sacked for shipment.—The shaft at the Nellie Bly has attained a depth of 37 ft., and some ore has been exposed.—At the Shasta and Aggie B. groups development is under way.—Ore has been uncovered in both properties.—Work has been resumed on the Cornforth, and the management states that shipping will commence at an early date.—In the South Klondyke district the Stormy Night and New Klondyke mines are showing up well. A small shipment of ore was recently made from the latter. The ore is principally silver-bearing with a little gold and lead.—In the Fairplay district several properties are being worked. The shaft at the Goldyke Reef is down 200 ft. A 50-ton Huntington mill is crushing the ore. Considerable water has been encountered and a pump has been ordered.—It is reported that the old Pactulus mine will be reopened by

local interests.—A large amount of tunnelling and driving is under way at the Nevada Alpine mine, at Lone Mtn. A body of ore is being developed. This property is the only silver-lead one in this district that is being profitably operated.—The presence of a large and increasing number of Italian miners in Tonopah is causing considerable dissatisfaction here. Miners of other nationalities and the majority of the business men are strongly opposed to them. The mine owners state that they are good workmen, and less liable to leave their work than the other men.

Tonopah, Aug. 31.

The ore shipments over the Tonopah & Goldfield railroad for the week ending August 29 were 2,693 tons, of which 1,015 came from Goldfield, and the remainder from the following companies in Tonopah: Tonopah Mining Co., 1,250 tons; Tonopah Extension, 210; Jim Butler, 78; Midway, 50; Belmont, 50; Montana-Tonopah, 40 tons. The

The shaft is down 200 ft., and 225 ft. of driving has been done. A Cameron pump and bailing-skip will be used to unwater the shaft. A 5-drill compressor is part of the present equipment.

WASHINGTON.

STEVENS COUNTY.

(Special Correspondence).—The Paymaster Mining Corporation, recently organized to operate on Toulon Mtn., is being financed at Chicago. The company owns the Salmon Tyee group of four claims, with good mineral showings. Samples of ore from a shaft and some open-cuts have assayed from \$4 to \$36 per ton in gold and copper. An adit will be driven 800 ft. with the expectation of striking ore at a depth of 800 ft.—A vein of gold-bearing quartz has been encountered in a 90-ft. adit on the Summit mine, six miles northeast of Orient. A drift will be driven and a shaft will be sunk from the floor of it.—The First Thought mine is hoisting and shipping 1,000 tons of ore per month. The vein is 27 ft. wide. It is estimated that 27,000 tons of ore are blocked out, which run well in gold and silver.

Republic, Sept. 2.

BRITISH COLUMBIA.

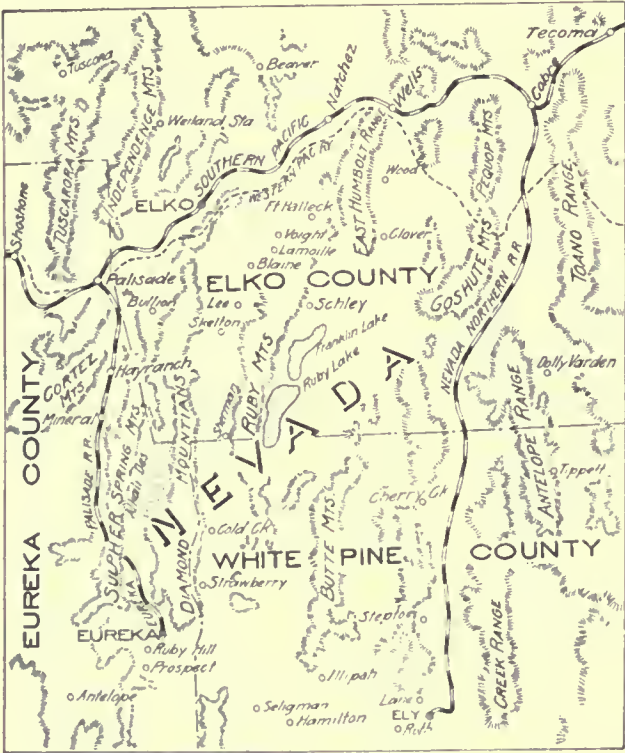
The Nelson board of trade has passed resolutions calling upon Premier McBride to stop the Crow's Nest Pass Coal Co. from exporting coke to Montana smelters. This is the outcome of the feeling to which we have often referred, in the Boundary and Rossland districts, that the smelters on this side of the line should have first call on the fuel supply, and that only the surplus above local needs should be exported. In response to appeals of this sort, Deputy Minister of Mines McBride has been despatched to Kootenay to investigate the matter. The reports of the custom houses show that already during this year about 25,000 tons of coke have been exported to the United States.

The Rossland mines shipped ore as follows during the week ending August 24: Centre Star, 2,480; Le Roi No. 2, 455; White Bear, 140. Total, 3,075 tons of ore.—The Centre Star company has been paying especial attention to development, while its shipping capacity is curtailed, on the Centre Star, War Eagle, Iron Mask, and Idaho.—At Le Roi, diamond-drilling continues in the Spitzee, and the cross-cut to the winze workings in the 1,650 level is finished.—At Le Roi No. 2 development of the new ore-shoot on the 700-ft. level continues with good results.—One of the Giant veins has been cut by the tunnel of the California-Giant company.—During the week the Trail smelter received 5,327 tons of ore, which, in addition to the Rossland shipments, came from the following sources: Snowshoe, Phoenix, 1,274; Victoria, Nelson, 137; St. Eugene, Moyie, 681; North Star, East Kootenay, 11; Lorna Doone, Silverton, 44; La Plata, Kokanee creek, 38; Granite, Nelson, 31; Rambler-Cariboo, Slocan, 22; Yukon, Ymir, 11; Yankee Girl, Ymir, 10; Ymir mine, Ymir, 20; Sunset Cody, Slocan, 20 tons of ore.—The Northport smelter is still idle, but has coke enough for a run of two weeks.—The shipments from southeastern British Columbia during the week may be summarized as follows: Boundary, 22,415; Rossland, 5,316; East of the Columbia river, 3,007 tons of ore. The smelter receipts were: Grand Forks, 7,695; Greenwood, 7,620; Boundary Falls, 5,806; Trail, 5,327; Nelson, 24, and Marysville, 600 tons. Total, 27,072 tons of ore.

MEXICO.

DURANGO.

H. H. Hughes, who took over the San Jose de Llanitos property, has secured a lease and bond on the San Andreas de la Sierra mines and smelter. This latter property has paid a large amount in dividends, in spite of the heavy transportation charges on account of the 125-mile haul to Tepehuanes.—The Minas de Oro de Guarisamey property is being developed under the direction of Charles L. Poindexter, and the showing is promising. This mine is situated about 130 miles west of Durango, and the ore carries silver and gold.—The Velardena M. & S. Co. is operating both silver and gold furnaces, and is getting a larger supply of ore than it can handle. W. H. Foster is the assistant manager.



Map of Eastern Nevada.

Tonopah M. Co. sent 2,520 tons to the mill, and the Belmont, 820 tons. The Montana-Tonopah is milling about 80 tons per day.—An air-compressor is being installed at the Jim Butler, which may necessitate a larger hoist, as the output should be greatly increased. About 300 tons per month are shipped to the smelters.

SOUTH DAKOTA.

The cross-cut tunnel at the Globe mine has proved the vein, and a lower adit has been started. E. J. Adams, of Peoria, Ill., is the president of the company.—Oscar A. Anderson, formerly superintendent of the Dakota wet-crushing cyanide mill at Deadwood, has been appointed instructor in metallurgy at the Dakota School of Mines.—The Grand View Mining Co. is employing 18 men and concentrate from the 5-stamp mill is being shipped to the Slip-Butler Co. of New York. The mine is in the antimony belt about a mile north of Silver City. The vein has widened to two feet at the 180-ft. level, where it was cut by a cross-cut from the vertical shaft.—The frame of the 30-stamp mill being built for the Lucky Strike M. Co. is completed, and the plant should be in operation by October.—The Deadwood slime plant of the Homestake company is treating about 900 tons per day, and 18 filter-presses are operating. Most of the material treated in this plant comes from the two stamp-mills at Terraville and from Golden Gate.

CUSTER COUNTY.

Operations will be resumed at the property of the Custer Creek M. Co., John H. O'Brien having recently perfected arrangements with the directors, at Albany, New York.

Special Correspondence.

Mexico City.

*Denver Men Successful.—Santo Domingo Co.—Mining Near Ayutla.
—Activity in Jalisco.—Deal at Guanajuato.*

In the State of Sinaloa, about 80 miles east of Mazatlan, Hugh Swearingen and Fred Matthews, of Denver, together with a number of their friends in the railroad circles of Denver, have taken up about 500 metres along an extremely strong vein, rich in gold and silver, which was located by C. E. Parlin, whom they had grubstaked. They have organized the San Miguel Mining & Reduction Co. for operating the same, which will be under the management of Mr. Parlin. The vein is said to vary between 50 and 250 ft. in width and is but 30 miles from the line that the Southern Pacific is building. Near their property, at Santa Lucia, a Mazatlan company is operating the Piedad Anexas, which, with two years' development work, is in bonanza ore, of which the high-grade is being shipped while the low-grade is stored for the mill now in course of erection. The mill is to consist of stamps, plates, and Wilfley tables, with a cyanide plant for treating the tailing.

In the Hostotipaquillo district, State of Jalisco, the Santo Domingo Mining Co. is to be congratulated in obtaining the services of Patrick Fitzgerald as manager. Mr. Fitzgerald is an old Colorado man who for several years has been operating (in the Mascota district of Jalisco) the Lupita mines and mill for Frank Peek and others of Colorado Springs. Last fall Mr. Fitzgerald left Mexico for a while to try his fortunes in Nevada, but not meeting with the success he anticipated, he returned this spring to Mexico and has taken up the position mentioned above as offering more favorable opportunities than seemed possible at the Lupita mines, which have always proved, because of their situation and distance from the railroad, a very close proposition. The Santo Domingo, however, is but four or five hours' ride from Etzatlán, and almost adjoins the property of El Favor Mining Co., controlled by Makeever brothers. They have been opening up large bodies of high-grade ore having every indication of being a continuation of the famous Mololoa vein, now being worked by Carlos Romero. The Santo Domingo itself, on its Esperanza claim, has for several months been working on a four-foot vein, which is continually improving, and is now stated to be as good as the best in the famous old Hostotipaquillo district. In addition to El Favor the Makeever brothers have recently taken over the old Tajo mines of San Sebastian, north and west from Mascota, and in one of the best parts of the State of Jalisco, near the boundary line of the territory of Tepic. From points on the property the shores of the Pacific may be seen. The property is one of the oldest silver mines in this old camp, and the new owners will open up the vein by two adits that should cut it at 600 and 1,200-ft. depth, and plans are being prepared for a power-plant on the Los Reyes river, for the operation of a 100-ton cyanide plant as soon as the vein has been sufficiently opened. There are several cyanide plants already in successful operation in this district.

In the southern part of the State near Ayutla, Kent E. Keller, after several years' hard work on the holdings of the Carrizo Copper Co., has opened up sufficient ore to interest St. Louis capital in the erection of a concentrator and 50-ton smelter on the property; the material has been ordered, construction is under way, and it is expected that it will be ready for business in January next. This part of the work will be in charge of A. L. Waters, who

was formerly with the National Metallurgical Co., of Matchuala, San Luis Potosi, and who is now at Ayutla attending to the work. Mr. Keller has also obtained a concession for a power-plant on the Carrizo river, which it is intended shall furnish power for the mines, mill, and smelter, as well as light for the towns of Ayutla and Purificacion.

From Guanajuato comes the news of an important transfer of mining property. The Dwight Furness Co. has transferred the La Fortuna group of mines to the San Gregorio Mining & Railway Co., of New York, which is represented at Guanajuato by H. H. Miller. Capt. W. Murdoch Wiley is president. The ore is largely valuable for its gold, as well as silver. It is expected that the new company will also take over the control of the railroad from El Chorro to Marfil, where it connects with the Mexican Central.

Johannesburg, Transvaal.

Result of the Strike.—Lower Wages.—The Ticket System.—The Beer Bill.—Boer Ministry Withdraws it.—Chinese Labor.

During the past few days almost all the mine managers have been visited by delegates from the strikers, to find out on what terms they could come back to work. The delegations were informed that most of the positions on the mines were filled, and that at present only a few of the men could be taken on again. Of course, the old terms were asked for, but the managers pointed out that one of the first laws of war is that the victors dictate terms, not the vanquished. The terms given to the strikers are that for the present all underground contracting ceases; that miners 'bossing' hammer coolies or Kaffirs receive 16s. 8d. per shift, the number of laborers to be superintended to depend entirely upon the wish of the management; that machinemen receive £1 per shift for looking after three or four machines, while the exceptional machine men who 'boss' one section of the mine with five or six machines, are to receive about £35 per month. Trammers are to receive from 10s. to 15s. per shift. The delegations retired rather crestfallen, for these terms are in some cases less than half what the rates were before the strike commenced. So hard up are the men, however, that the vast majority will go to work on these terms, if any openings are found for them. The ex-strikers are now looked upon as belonging to the band of unemployed.

Such a complete rout as the underground men have had is seldom sustained by workmen anywhere, and the folly of an ill-considered ill-managed strike is well illustrated by this affair on the Rand. That the absurdly high wages prevailing on the mines had to come down no one for a moment doubted, but had the men kept quiet it would have taken seven years to accomplish what the strikers by their precipitous action have done in seven weeks. The former system of underground contracting will be changed to a great extent, and the terms will be such that men will not earn from £75 to £100 per month as formerly. In the future the expert miner will be able to earn on contract from £35 to £40 per month, while the poorer class of man can earn about half that amount.

The mines are introducing the ticket system on the Rand. Before he can obtain a job the miner will be asked to show a discharge ticket from his last employer. Every other class of laborer must show a testimonial before he can get work on a mine, and in the future the miner will do the same. Seeing that they have lost the game, the miners are calling on the Government to repatriate the strikers. It would save a lot of suffering in the future were the Government to send these men to centres where labor can be found for them, for unless the

Rand expands a great deal, no openings can be found for them here.

The community and, indeed, all of South Africa were much excited last week over a bill that the Boer ministry tried to thrust down our throats, namely the 'Beer Bill,' which provided for the sale of beer, ale, etc., to Kaffirs. Since the war it has been illegal to sell intoxicating liquors to Kaffirs, and the consensus of opinion all over South Africa is undoubtedly in favor of total prohibition so far as the native races are concerned. The Boer ministry framed the bill with the idea of attracting Kaffirs to the mines, for the natives are fond (as others!) of alcoholic drinks. It was also intended to pacify the brewers of the country, for an extra tax has just been put on beer. The bill was also a concession to the Portuguese, from whose possessions on the East Coast the natives come in large numbers to the Rand. Had this bill passed, Portuguese wines would have been imported in large quantities for the natives on the Rand. So violent

will remain in the Transvaal. The rumor might be an idle one, but it comes from a very good source, and every one is hoping it is true.

Sir Percy Fitzpatrick, who for many years has been a member of the firm of H. Eckstein & Co., has resigned. He is one of the leading lights of the Progressive Party and finds it impossible to do justice to both politics and mining. He will now give his whole time to the service of the State, and his intimate knowledge of the needs of the mining industry make him an authority of great importance in the parliament at Pretoria.

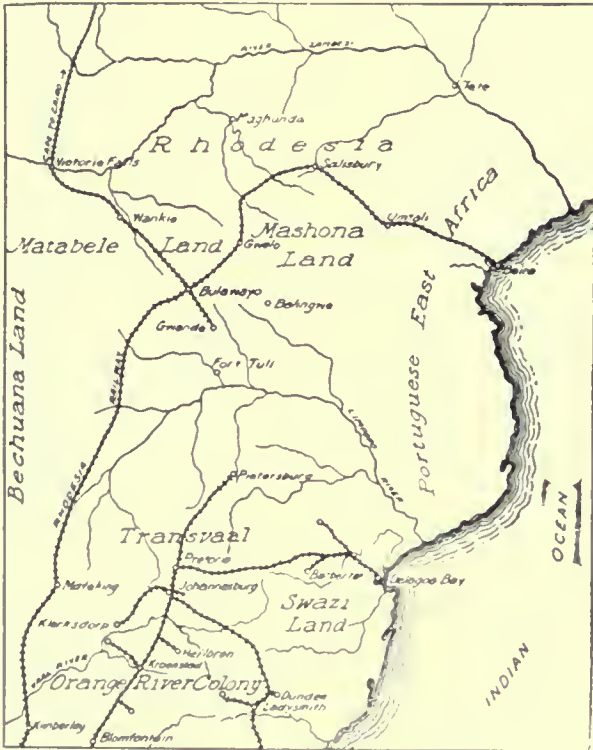
Butte, Montana.

Production of Copper in August.—New Management for Barnes-King Co.—Enlarging the Belmont Shaft.—The Bullwhacker is Closed Down.—Boston & Montana.—The Machinists' Strike.—Operations Crippled.

The estimated copper output of the Butte district in August was 27,636,655 lb., against 27,157,395 lb. in July. A number of mines show an increased production, but the total was kept down by a suspension of operations at the Neversweat, Gagnon, West Colusa, and Bullwhacker, and a reduced output from the Original, Stewart, and Minnie Healey, the decrease from the two first during the latter part of the month having been due to the strike of machinists, and that from the Minnie Healey being caused by the gas from a fire in the workings of a connecting property. The total ore tonnage and copper production for August were as follows:

Company.	Tons of ore.	Pounds of copper.
Boston & Montana.....	104,160	7,082,880
Anaconda.....	125,550	7,533,000
Butte & Boston.....	20,150	1,223,150
Washoe.....	10,850	651,000
Parrot.....	11,625	682,652
Trenton.....	12,710	762,600
North Butte.....	38,750	3,100,000
Coalition.....	46,500	3,115,500
Original.....	27,900	1,701,900
East Butte.....	7,750	589,000
Pittsburgh & Montana.....	9,300	744,000
Miscellaneous.....	6,200	465,000
Total.....	421,415	27,636,655

At the special meeting of the stockholders of the Barnes-King Development Co., held at Kendall, a new board of directors was elected and a complete change in the management of the company made. The old directors, against whom charges of mismanagement were made by many dissatisfied stockholders, were deposed and five out of the eight new directors were elected from Butte, so that the management of the company's affairs will be directed from this city. The new directors are John Gillie, general manager of the Amalgamated mines; Charles W. Goodale, manager of the Boston & Montana mines and smelter; L. O. Evans, attorney for the Amalgamated Copper Co.; D. J. Hennessy, head of the Hennessy Mercantile Co., formerly an Amalgamated corporation; Joseph H. Case, of Butte; Thomas S. Dee, member of the Boston firm of Paine, Webber & Co.; John C. Lalor of New York, manager of the Marcus Daly estate; Julian Gerard, son-in-law of Mrs. Daly, and a New York banker. The directors elected Mr. Gillie president of the company, and selected George T. McGee, for many years one of the Amalgamated superintendents, as manager of the mines. The complete change in management was made necessary to prevent litigation with dissatisfied stockholders. The new directors announce that a complete and detailed financial report will be made to stockholders as soon as it can be prepared. William H. A. Fischer of New York, who attended the meeting and represented 125,000 shares of opposition stock, expressed



Map of the African Goldfields

was the storm of adverse criticism, however, both in this country and in England, that the Botha ministry has climbed down, and withdrawn the Beer Bill. The Boers are masters in the art of retreating, both in war and in parliament. Some devout souls consider that the grave blunder the Boers have made in bringing forward this bill is the first nail in the coffin of the ministry, but the champions of the Boers in England, the Liberal Party, have placed so many winning cards in the hands of Het Volk, that with a little skill in playing them the Dutch can hold their position indefinitely, no matter if they wreck the mining industry or not.

An interesting rumor is going the rounds just now, which, if true, will put new hope into the whole country. It is stated that the strenuous Opposition has so hammered away at the Botha ministry on the subject of unskilled labor, and the practical impossibility of replacing the Chinese at present with Kafir labor, that the ministry has agreed to reconsider the whole question of Chinese labor, in a short session of Parliament to be held in November. If the Boers have made this concession it is the thin edge of the wedge, and there is still hope that the Chinese, save the few hundreds that have already left,

himself well satisfied with the result of the meeting and the election of the strong board of directors.

The Anaconda Copper Mining Co. has started to enlarge the Belmont shaft. The shaft is 1,000 ft. deep, but has only two compartments. It will be enlarged by the addition of another compartment and will be re-timbered. The work will take several months. The shaft will be sunk deeper after it is enlarged and will be connected at various levels with cross-cuts from the Anaconda mine. One connection from the 1,600-ft. level has already been made, connecting with the Belmont shaft at the 900. It has been said that eventually the Belmont would be made the main working shaft of the Anaconda mine, but this has been denied. That it will become an important feature in the Anaconda mine operations is certain.

Patriek Clark, principal owner in the Bullwhacker Mining Co., says the mine has been closed because of the decrease in the price of copper. "When copper dropped to 18c. the Bullwhacker ceased operations," he said. "The mine will be re-opened when improvements are completed. Investigations and experiments are now being made by C. M. Fassett of Spokane to ascertain the advisability of installing a 100-ton leaching plant at the mine.

The quality of the ore is such that it is mined for its copper value only. Copper silicates are found, but no gold or silver. The leaching process, which is likely to be installed, has been invented by Mr. Fassett. The mine has paid two dividends of \$10,000 each, and after the installation of the leaching plant, we shall be prepared to resume active operations and payment of further dividends. None of the Butte mines, the greater producers of copper, will be forced to close down unless the price of copper drops below 11c. Because the Bullwhacker has no smelter, we cannot operate and sell our product at the present prices."

The Boston & Montana Co. is sinking the East Colusa shaft, which is 900 ft. deep, the intention being to sink it to a depth of 1,200 ft. No sinking had been done on the East Colusa in 10 years, but a lot of high-grade copper ore has been mined from the property above the 900-ft. level. The Boston & Montana is increasing the size of its ore-bins at the Pennsylvania and Mountain View mines. Their capacities will be doubled in order to provide storage-room and guard against a repetition of last winter's experience when, during a short and exceptionally severe spell of weather, the ore froze and could not be shipped, necessitating a suspension of mining. The bins at the Mountain View hold 4,500 tons and those at the Pennsylvania 2,000 tons. The proposed increase will make room for 6,500 additional tons of ore.

The Gagnon, Neversweat, West Colusa, a portion of the Original, Stewart, and Minnie Healey mines are closed. The suspension at the West Colusa and in a small portion of the Minnie Healey is due to the gas from the fire in the workings of one of the properties in that vicinity, and operations in the West Colusa will probably not be resumed until the new upcast shaft is completed, when the mines can be thoroughly ventilated. The trouble at the Gagnon, Neversweat, Original, and Stewart is due to the strike of machinists. The Original mine furnished air for the Gagnon, Original, Stewart, and the Original Davis-Daly cross-cut, but the air-compressor broke and, there being no machinists to make the repairs, work had to be suspended. At no other mines of the district has the strike interfered with operations, but it will be only a question of time when other mines will have to close unless there is a settlement of the strike. So far there has been no effort made to settle by the mining companies. Ben B. Thayer, assistant to the president of the Amalgamated Co., was in Butte at the time the ma-

chinists walked out, and it is understood that he took a decided stand in opposition to granting the machinists' demands for an increase of wages from \$4.50 to \$5 per day. Other managers who have expressed themselves on the subject have declared that the demands will not be granted and that as it becomes necessary mines will be closed and kept closed indefinitely. The miners' union has put a stop to the repair work that was being done by its members, and miners can now repair nothing but their machine-drills. For several weeks they practically did all of the machinists' work about the mines.

Calumet, Michigan.

Use of Electric Power.—Winona Copper Co.—Exploration at the Globe.—The Tamarack Shafts.—The Cliff.—Shaft-houses of the Champion.

There has been a rapid increase in the use of electric power in place of steam in the Lake Superior copper mines during recent years. The Calumet & Hecla is making remarkably broad use of it and a short time ago work was started clearing the site for a large electric power-plant for the Copper Range Consolidated Co. next to the Michigan smelter, on the south shore of Portage lake. As a result of the recent visit of four directors at the Victoria mine, in Ontonagon county, it was decided to install an electric plant to light the buildings and to purchase two electric locomotives for use underground in the long drifts and cross-cuts, where it is difficult to get trammers to work. There have been numerous and important improvements at the Victoria's stamp-mill in the last few months and the plant is now treating more than 350 tons of ore daily. Eight jigs have been replaced by half that number of Wilfley tables, resulting in a greater saving of copper. The loss of copper in the tailing is now only one-sixteenth of one per cent. The new cylinder for the stamp was delivered two weeks ago, although the manufacturers agreed to have it on the ground six months ago. It is expected that the Victoria mill will be able to treat 700 tons daily after the new cylinder has been installed.

An assessment of \$1 per share, payable on September 3, will place \$100,000 in the treasury of the Winona Copper Co. for use in continuing development work. The deadlock in the copper situation has resulted in the Winona making no sales of copper since the May output was sold. As funds are needed now to provide coal and other supplies for the winter season, a call upon the stockholders was necessary, notwithstanding that the mine has been earning a fairly good profit on its limited production for the past several months.—Preparations for carrying forward the development work at the Globe property, under option to the Copper Range Consolidated, are going along steadily. A frame shaft-house for temporary use is practically completed. It will fulfill the requirements of the property during the early development period. Hoisting has been done with a bucket, but the skip will now be employed. It is expected that one of the smaller hoists formerly used at the Champion mine will be moved to the Globe.

Owing to the installation of a new drum in the engine-house at No. 3 shaft of the Tamarack, the production of that company may show a decrease for August. It was necessary to stop hoisting at the shaft for a short time while the new drum was being placed in position; the old drum had to be raised from its bearings, and the hubs taken off. Nearly 20,000 rivets were removed. The shaft, weighing 65 tons, also had to be raised. The new drum is similar to that in use at No. 5 shaft. It has a diameter of 18 ft. at its widest point and is known as a semi-conical drum. There has been no disturbance to

underground operations at No. 3. Ore was mined as usual and stacked for shipment later on.

There are now 50 men at work at the old Cliff property, in Keweenaw county, one-third of whom are employed in underground operations. The Tamarack Mining Co., which owns the Cliff, is exploring it by means of workings from the old No. 1 South Cliff shaft. A small but adequate surface plant has been provided. A siding from the Keweenaw Central railroad reaches the boiler-house and provides economical means for handling coal, etc. Grading has been finished for a railroad spur from the main line. One of the larger buildings on the property has been converted into a boarding-house and several of the other old dwellings have been repaired and rendered fit for the use of the workmen and their families.

R. M. Edwards, the superintendent, is pushing work in the Franklin's No. 1 Pewabic shaft and has pro-

Salt Lake, Utah.

New Railroad for Bingham.—Output of Copper.—Shipments From Tintic.—The Western Pacific.—Scarcity of Coal.

The filing of articles of incorporation last week of the Bingham Central Railway Co. indicates that efforts are being made toward putting an end to the ore transportation difficulties of Bingham. It is said that the new road will have an entrance into Salt Lake City and that close traffic arrangements will be made with the Harriman system. Branch lines are to be built to the various points where ore goes for reduction in mill and smelter, and thus the Bingham Central is to become an active competitor of the Rio Grande Western—both for freight and passenger traffic. The camp of Bingham will be entered in a unique way. The Mascott Tunnel of the Dalton & Lark mine is to be utilized for this purpose; it



The Copper Region of Lake Superior.

Each rectangle is a township, six miles square.

Key to Mines.

- | | |
|---------------------|------------------|
| 1. Atna | 19. Tamarack |
| 2. Empire | 20. Osceola |
| 3. Delaware | 21. Tecumseh |
| 4. Amygdaloid | 22. Rhode Island |
| 5. Copper Falls | 23. Franklin, Jr |
| 6. Central | 24. Franklin |
| 7. Phoenix | 25. Arcadian |
| 8. Cliff | 26. Quincy |
| 9. Mohawk | 27. Isle Royale |
| 10. Ahmeek | 28. Atlantic |
| 11. Allouez | 29. Baltic |
| 12. N. Kearsarge | 30. Trimountain |
| 13. Wolverine | 31. Champion |
| 14. Mayflower | 32. Belt |
| 15. Centennial | 33. Adventure |
| 16. Tamarack Jr | 34. Mass |
| 17. S. Kearsarge | 35. Michigan |
| 18. Calumet & Hecla | 36. Victoria |
| | 37. Whona |

gressed as far as the 14th level. It has been costly work re-opening this shaft, as the workings were abandoned several years ago and fell into a bad state of decay, necessitating the shaft being practically rebuilt at many points.

Rapid progress is being made by the Wisconsin Bridge & Iron Co., which has the contract for enlarging the shaft-houses at the Champion mine. Work at E shaft has been completed and attention is now being confined to B shaft. As soon as the latter is finished, work will begin at C and D shafts. At B shaft-work is well under way on the new hoist.—Thomas F. Cole, Chester A. Congdon, C. D'Antremont of Duluth, and John D. Ryan of Butte, were visitors here this week. Some of them visited the Keweenaw Copper Co.'s workings in company with Capt. Thomas Hoatson of Calumet, mining director for that corporation.—Edward Kopps, superintendent of the Michigan gold mine, near Ishpeming, has been advised by the Abbé Engineering Co. of New York that the tubemill ordered several months ago, has been shipped.

Two diamond-drills have been working for a month on the Copper Range company's property, at No. 1 camp, northwest of the Champion mine, near the road from Painesdale to Trimountain. Important results are expected from the work, and progress has been watched with a good deal of interest. Up to the present no information has been given out as to what has been accomplished, and probably will not be for some time. The fact that the crew is kept at work is considered a favorable indication that some trace of copper has been found.

is now being extended into the domains of the Ohio Copper Co. and by continuing it, the ores of the Utah Copper, Boston Consolidated, and other mines of the district will be made accessible. Although the articles of incorporation do not indicate it, it is nevertheless true that F. Augustus Heinze is a factor in the enterprise. It is proposed to build about 50 miles of track.

Figures obtained from authentic sources place the copper output of Utah smelters during August at 8,000,000 lb., which is considerably under the production of July. The decrease is due to the transportation difficulties—principally at Bingham. The Boston Consolidated laid off 300 men because of the lack of cars; while the Yampa, Utah Copper, and Utah Consolidated, for the same reason, could not keep their production up to normal. The lead production for the month is estimated at between 13,000,000 and 11,000,000 pounds.

The shipments of ore from the Tintic district during the past week aggregated 176 carloads, the contributing mines and respective amounts being: Beek Tunnel, 11; Colorado, 10; Eureka Hill, 9; Yankee Con., 4; Uncle Sam Con., 7; May Day, 7; Eagle & Blue Bell, 7; Centennial Eureka, 51; Bullion Beek, 4; Ridge & Valley, 3; Scranton, 8; Victoria, 2; Ajax, 3; Grand Central, 8; Lower Mammoth, 7; Mammoth, 20; Carisa, 1; Depue, 5; Victor Con., 1; United Sunbeam, 1 carload.

The New England Gold & Copper Co., controlled by Boston parties, produced 15 cars crude ore and concentrate during August. This brought returns of \$500 per car at the smelter.—The Utah Apex Mining Co. made a good record of production in August. The Markham

Guleh mill was kept running up to capacity on low-grade ore from this property.—The Utah Consolidated Mining & Milling Co. recently organized, has begun the development of its Tintic property, which was a producer of some consequence several years ago.—The Lower Mammoth mine at Tintic has been closed pending the installation of a new hoisting equipment. An electric plant is being installed capable of going to 3,000 ft. with the shaft.—The new equipment recently ordered for the Sioux Consolidated is in operation.

Official announcement has been made that the Western Pacific Railroad Co. will open its line for freight and passenger traffic between Salt Lake and a junction point with the Nevada Northern Railroad in Nevada on October 1. The road being a Gould enterprise, it will be operated in connection with the Rio Grande Western at Salt Lake. The Western Pacific will be the shortest route from Salt Lake to Ely by about 100 miles.—The fuel famine experienced in Utah last winter, and the probability of another one during the coming winter, has resulted in the organization of several new coal mining enterprises. There are 14 coal mines in operation in the State at the present time, and the estimated output is between 6,000 and 7,000 tons per day. In Carbon, Emery, and Iron counties are vast undeveloped deposits that will soon be made available and put an end to the present scarcity of coal. Domestic coal is selling at from \$1.25 to \$1.75 per ton higher in Salt Lake than it did this time a year ago. Retailers get from \$6 to \$6.50 per ton.

Cripple Creek, Colorado.

Lease on the Abe Lincoln.—New Orebody in the Cresson.—Portland Continues Deep Development.—Golden Cycle Mill.—Elkton Pays a Dividend.—The Vindicator Mill.

John Sharpe, the successful general manager of the Colorado State Investment Co., has acquired possession of the lease held by the Tunnel Mining & Leasing Co. on the Abe Lincoln property of the Stratton estate, the cash consideration being \$5,000. This property has been under the management of Walter Swanson, who has placed it in the first rank of producers. It was supposed at one time to have been worked out after making several small fortunes for various lessees, but under Mr. Swanson's management it has come to be one of the best mines in the district. Mr. Sharpe has started with a full force of men and it appears probable that the first six cars from a clean-up of ore already broken in the stopes will compensate for the price paid for the lease. Operations that have brought the property up to its present high state of development were begun on a vein less than 5 ft. wide, the vein steadily increased in size until it now measures from 12 to 15 ft. across, and has produced ore to the value of better than \$30 per ton for four months. Mr. Swanson goes to Wyoming to take charge of holdings recently acquired by his company near Shoshone.

The Cresson property, which has been one of the steady producers of the camp, has opened a new ore-shoot on the 500-ft. level. This was accomplished by driving a cross-cut north of the shaft. The property has made an output of about 2,000 tons per month, and this new find is certain to increase the tonnage. Chicago capitalists control the company and announcement is made that at a meeting to be held in this city on September 3 the capital stock will be increased from 1,000,000 to 1,250,000 shares, of \$1, and the number of directors from 5 to 9 members, these propositions to be submitted to the stockholders. The object of increasing the capital stock is for the purpose of acquiring the lease held by the Bull

Hill Mining & Developing Co., whose output has been about 2,000 tons of ore per month.

The Portland continues the work of development at a depth of nearly 1,600 ft. from the surface. One of the orebodies from the 1,200-ft. level is about 20 ft. wide and its length is not yet determined; other orebodies not so wide at this depth are giving profitable returns. Sinking will continue some 40 ft. more when cross-cuts will be run to connect with the 1,200-ft. level. The Portland mill is operating at nearly full capacity on ore entirely from this mine.—A statement has been made that the Golden Cycle mill will be in operation early in December; the work of rebuilding is being carried forward rapidly and the management announces its willingness to accept contracts at the old rates.—The Jennie Sample property has drawn the fire from the boilers and will not do any more hoisting until the Golden Cycle mill resumes operations. It is unwilling to accept the smelter rates and, though there is a large amount of ore broken in the stopes, prefers to wait. Some useful development work has recently been accomplished; large orebodies are blocked out on both the 300 and 500-ft. levels and a cross-cut has been driven to make better air-connections.

The Elkton Consolidated Mining Co. has declared another dividend, the fourth this year, the sum disbursed amounting to \$37,500. The condition of the mine is excellent. Cross-cutting is under way on the 700 and 800-ft. levels; the shipping ore is hoisted from the 600 up to and including the 300-ft. levels. Ore that would be considered of good average value in other properties is held in reserve, only the higher grade is hoisted. The smelter returns amount to about \$35,000 per month on an output of 1,200 tons.—The Christmas Gold Mining Co. has declared a dividend of \$1,000.—The Proper claim of the Stratton estate on Gold hill has made a second shipment from a recent strike, and the interest of prospectors is aroused so that many efforts have been made to obtain leases on adjoining properties. The mine is under lease to the Union Leasing Co. Some excellent specimens of sylvanite are on exhibition. The vein is now 2 ft. wide, and the orebody was encountered while driving for the junction with another rich orebody.

The experimental mill on the Vindicator property recently renewed operations and is handling about 40 tons of ore per day. The management expects, however, to increase the capacity in the near future.—A new cyanide mill is in contemplation on the Wedge property on Raven hill, specifications and surveys have been made. Eastern capitalists are looking over the property and until they finish their inspection nothing will be done toward the erection of the mill; if negotiations fall through, the construction of the mill is likely to be started. The Wedge has been idle for some time owing to a disagreement, but a large amount of ore lies broken in the stopes and about \$75,000 worth is estimated to be in sight in two big ore-shoots opened from the 300-ft. level.—After a shut-down of a short period the Jo Dandy mill has resumed. A new Butters filter-press has been added. The mill treats 100 tons per day.

A strike has been made on the Red Bird property belonging to the National Mining Co. on Gold hill. Harris & Co., operating the lease, have been doing development work for several months, following a vein for 50 ft. without getting pay-ore. Sinking was finally decided upon and 20 ft. below the tunnel-level rich sylvanite was encountered in a breccia formation. The vein measures at this point 4 ft. between walls and the winze put down is but 200 ft. from the portal of the tunnel.—The Trilby mine had a contract with the Golden Cycle mill to treat its ores, but is compelled to make other arrangements since the destruction of that plant.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

ANORTHOSITE is a name applied to granitoid rocks that consist of little else than labradorite, and that are of great extent in eastern Canada and the Adirondacks. These rocks are extremes of the gabbro group, into whose typical members they shade by insensible gradations.

A **SYSTEM** of riffles, consisting of a row of blocks alternating with an equal area of rocks, has been found to work successfully. This arrangement in the sluices reduces the wear on the blocks, but it is not desirable for those sluices that have to be cleaned up frequently.

THE object of annealing structural steel is to secure homogeneity of structure that is supposed to be impaired by unequal heating or by the manipulation attendant on certain processes. The objects to be annealed should be heated throughout to a uniform temperature and uniformly cooled.

THE majority of the important limestones are of marine origin, but in certain geological formations fresh water ones are well developed. The calcareous remains of organisms have been their principal source, and of these the foraminifera, the corals, and the molluscs, are the chief contributors.

METASOMATIC is a term used to describe the replacement of one or more of the minerals of a rock by others. The form of the originals is not at all preserved as in pseudomorphs, nor does the chemical composition remain the same while the form alters as in paramorphs, but both customarily change.

LIMESTONES feel the effect of metamorphism with exceptional readiness, and under deforming stresses, probably accompanied by elevation of temperature, and in the presence of water, or along the contacts with intruded dikes and sheets of igneous rocks, they lose their sedimentary characteristics, such as bedding-planes and fossils, and change into crystalline marbles.

FRAMED STRUCTURES in general consist of one or more triangles, for the reason that the triangle is the one polygonal form whose shape cannot be changed without distorting one of its sides. Problems in stresses of simple framed structures may generally be solved either by the application of the triangle, parallelogram, or polygon of forces, by the principle of the lever, or by the method of moments.

CONDUCTION is the transfer of heat between two bodies, while convection, or carrying of heat, means the transfer and diffusion of the heat in a fluid mass by means of the motion of the particles of that mass. The conduction of heat through a stagnant mass of fluid is slow in liquids, and almost unappreciable in gases. It is only by the continual circulation and mixture of the particles of the fluid that uniformity of temperature can be maintained in the fluid mass, or heat transferred between the fluid and a solid body.

RECIPROCATING steam engines have been broadly classed either as 'high-speed' or 'low-speed' engines, but these terms are misleading, as the piston speed, which is the determining factor in any engine, is the same in both. In addition to this, in the low-speed

engines there are larger and heavier masses of metal in motion. The terms 'quick-revolving' and 'slow-revolving' have recently been substituted, and more accurately express the relation between the two types. The so-called high-speed engine runs at 300 to 400 rev. per min., and the low-speed from 50 to 150 rev. per minute.

DRY-WASHING was carried on in the early days principally by Mexicans, in those districts where water could not be obtained. Their method consisted in pulverizing rich dirt, thoroughly drying it, and then working it in a batea, the earthy portions being separated from the gold by a circular motion. The gold was also extracted by winnowing. Recently a variety of machines have been invented for this kind of work, but the application has necessarily been limited. Several novel applications of these principles in the arid deserts of the Southwest have proved successful in a limited way, notably in Nevada and Arizona.

TEMPERING STEEL is the act of giving it, after it has been shaped, the hardness necessary for the work it has to do. This is done by first hardening the piece, generally a good deal harder than is necessary, and then toughening it by slow heating and gradual softening until it is just right for the work. A piece of steel properly tempered should always be finer in grain than the bar from which it is made. If it is necessary, in order to get the required hardness, to heat it so that after being hardened the grain will be as coarse as, or coarser than, the grain in the original bar, then the steel itself is too low in carbon for the desired work.

BAUXITE has proved to be of great value as a basic refractory material in that it resists well the scouring action of metallic oxides in the furnace. For this purpose it is used most conveniently in the form of bricks. The Berger patent covers a process for making these bricks. Natural high-alumina low-silica bauxite from Arkansas is used, bonded by a small percentage of plastic fire clay, sodium silicate, or lime. The bricks contain from 88 to 90% of alumina and from 10 to 12% of ferric oxide, silica, and titanate acid. The percentage of silica can be reduced to 6 or 8% by the use of a bond free from silica, so that the brick is not appreciably detrimental to basicity. Bauxite brick seems to be especially adapted for the linings of basic open-hearth steel furnaces. The highest grade is used in the floor and walls up to the slag line, protected by a bed of calcined bauxite. Above the slag line cheaper brick with a lower percentage of bauxite can be used.

THE rigid classification of materials into conductors and non-conductors is responsible for a prevalent idea that the former only are capable of electrical conduction. Strictly speaking all materials are conductors in the sense that they are to some extent able to transmit electricity. Current is transmitted through gases by means of electrically charged particles, and modern theories substantially agree that the conducting process is the same for all substances whether they are in a gaseous, liquid, or solid state. These charged particles which have been termed ions are assumed to consist of atoms or of combinations of atoms or of infinitely smaller negatively charged particles known as electrons. It is conceived that all atoms contain one or more detachable electrons whose aggregate negative charges are balanced by an equivalent positive charge possessed by each atom, and the addition of an electron, or its removal from one of these neutral atoms or combinations of atoms forms an ion possessing an excessive positive or negative charge.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

A Fundamental Problem.

The Editor:

Sir—What is the matter with 'S.T.'? He is seriously in error in his otherwise interesting communication in your issue of August 17 when he tells would-be investors to keep away from mining. That is what it amounts to when he says: "The mining districts, and every conceivable spot, to the ends of the world, are constantly being scoured by an army of keen-eyed, clear-brained, carefully trained men." "Whose business it is to go over the surface of the earth with a fine-toothed comb, from the poles to the equator and back." Again, "Always hunting for desirable properties, promising prospects, or good indications." He means by this that every new find that is good for anything is snapped up the moment the strike is made. Mining engineers are everywhere either out for themselves or in the employ of syndicates, and when they see the prospector hurl his pick through the air and know that his dream has at last come true, they spring to him from behind every greasewood bush and boulder, and fill in their already signed checks when he names his price.

Experts play their part and are entitled to all they get, but even they would smile over this fine-toothed comb-work between the poles and the equator. Rarely do any of them get onto the ground until the merits of a discovery of mineral is an old story in the camp where it was made; and a mining engineer is not a fixture in one mining district out of fifty, and as to his getting around to other than bonanza camps, it can be said that his visits to where the sizzle of a boom is not heard, are like those of the angels, few and far between.

A mining district that cannot show to those who would embark in this the most profitable of the industries an opportunity for sound investment, cannot justly be considered as being within the mineral belt, and is a place the wise will avoid.

NORTH STAR.

Atolia, Cal., August 19.

Ore Deposition.

The Editor:

Sir—I have been reading paper after paper on ore deposition, including the splendid one in your issue of August 17. My old master, Bernhard von Cotta, taught me, both in the classroom and in the field, that we must take everything into account before forming opinions or drawing conclusions. Now we know that rock masses contain enormous quantities of hydrogen gas, and so do mineralized bodies. In vain have I sought for even the word hydrogen in all these treatises, and yet it seems to me that to the chemical geologist (and every geologist should be well grounded in chemistry), the action of hydrogen cannot be neglected, especially if nascent and under pressure in vast quantities. How did it get there, and what has it done, and what can it do, are questions that confront us, and so far I have seen no attempt to tackle the problem.

We hear a great deal about carbonic acid and the part it plays, but most acid rocks, as far as I know, contain from two to fifteen times more hydrogen than carbonic acid gas. The basic rocks, such as basalt, seem to have about equal quantities of hydrogen and carbonic acid.

It seems to me that as a reducing agent it may be one of the main causes in the formation of native metals and lower sulphides such as pyrrhotite and bornite, which

are often associated with gold in acid rocks very high in hydrogen. I remember hearing Henri St. Claire Deville say that he thought hydrogen nascent and under high pressures, and from high temperatures to low ones, must have exercised an immense influence on the formation of rocks and mineral deposits. At that time he was studying the dissociation of gases at high temperatures. I suppose what we have stored up in the rocks in the way of gases is merely the remnant of nature's prodigality, but to read some papers on ore deposition you would think nature was as mean as man. The hydrogen in the rocks plays a great part in disintegration as exemplified in granites, which run very high in hydrogen, and it also must influence plant life. If the hydrogen be derived from water, think of the nascent oxygen set free below, and the work it must have done in mineral zones and is still doing. Modern research is showing us the great influence of even rare gases and emanations, and it seems to me that we shall have to change our ponderous theories on ore deposition for something lighter and more up-to-date. The trail of water is plain and easy to follow, but not so with gases. We see the camel, but miss the gnat. Forty odd years' experience, in the field and underground, have led me to believe M. Deville was right, and that gases have played a greater part in the chemistry of the earth than solutions; and now modern research is pointing the same way. No modern analysis of rocks or minerals is complete that does not give the gases as well as the solids. The enormous quantity of hydrogen in the earth's crust must be there for a purpose; it must have done and be doing something. The longer I live and travel, and the harder I work, the less I know.

WALTER E. KOCH.

El Paso, August 23.

Testing Mill-Tailing.

The Editor:

Sir—Assayers at gold mines are often called upon to determine the cause for high losses in the tailing. The amalgamator in charge of the mill is positive that the assayer has got the samples or fluxes in the assay-office salted; or else is reporting the tailing high out of pure cussedness. At such times it becomes necessary to make a careful and systematic investigation of the milling processes.

The conditions governing good amalgamation and concentration are now so generally understood that excessive losses are of rare occurrence. A casual inspection of the plates and a vanning test on an average sample of tailing should be sufficient to detect any serious errors in the treatment. If the amalgam is hard and crystalline, or is breaking away from the plates in little crooked strings, with puddles of mercury dripping from the lower ends of the plates; or if the concentrators are dirty and sloppy, I would advise a change in the mill-crew before spending much time in trying to ascertain the cause of loss.

If, however, everything in the mill seems to be properly conducted, the trouble will generally be found in the milling process itself as being not properly adapted to the ore. At such times, if there are reserves of ore in the mine large enough to justify an installation, it is best to make a series of cyanide tests on the ore and tailing, as this process is likely to be effective in the majority of cases. Where this fails, as it sometimes does chiefly from chemical causes, it is necessary to improve the amalgamation and concentration processes to effect the highest recovery. In my experience I have found that the most fruitful source of avoidable loss is occasioned by a too fine crushing of the ore, as indicated by an excessive loss in the fine slime.

To begin with, for a laboratory test, it is essential first

to procure an average sample of the tailing. This is best taken by means of some automatic device that takes a regular and true sample at short intervals, for a considerable period of time.

An amalgamation test is sometimes desirable, though I have usually found it unreliable, for the reason that if there are mistakes in the amalgamating of the ore, it is very difficult to recover floured amalgam by the ordinary laboratory amalgamation test of agitating the tailing in a bottle with mercury. Where the amalgam has become hard and crystalline it will not be readily taken up by mercury; though sometimes if the tailing is heated during drying, the amalgam undergoes a physical change that renders it amalgamable in a bottle. I once found a case of this kind at a mine in Shasta county where I had an engagement to investigate the mill-losses. The men in charge were running the mill with a deep discharge, and trying to catch most of the gold on inside plates, which were in a very hard condition, and by their smooth surface, clearly indicated a scouring action. An amalgamation test on a settled sample of the tailing failed to show any appreciable recovery. But when I heated a sample to the boiling temperature before making the test, I was able to recover about \$1.50 per ton by amalgamation. On the other hand, if the loss is occasioned by base mineral or by over-milling the ore, the floured particles are usually coated with a film that interferes with the test.

For making a test I get as fair a sample as I can from the mill, consisting of approximately two pounds of the wet tailing. The sample should be taken and given sufficient time to settle clear without the use of any precipitants such as alum or lime water. Any coagulating substance will interfere with the subsequent separation of the slime into different grades of settling.

For the amalgamation test I charged the wet tailing into a large acid bottle, add about 100 grains of pure mercury, and agitate for about one hour. I often had a great deal of trouble in procuring quicksilver that was entirely free from gold until I hit upon the following scheme for preparing it: I take an excess of the impure retorted mercury and dissolve a portion of it in strong nitric acid. If there is more of the mercury than the acid can dissolve, all of the gold contents will remain amalgamated in the undissolved portion. I decant the nitric solution and precipitate with pure copper wire, using for the purpose any old scraps of electric wire. While the mercury prepared in this way may not be chemically pure, I have never detected a trace of gold in any of it, even when prepared from mercury that was heavily charged with the metal. Having given the charge of tailing sufficient agitation to amalgamate all of the gold that will amalgamate in this way, I wash out the charge into a clean mining pan; and using some other clean receptacle for a tank, I carefully ran out and separate all of the mercury and concentrate. To effect as close a concentration as is possible on a well-adjusted vanner, it is necessary to repeat the vanning several times. Having separated the amalgam and concentrate from the tailing, I next separate the quicksilver from the concentrate. Quite a lot of the mercury will usually be found so badly floured that it is difficult to get it to unite together in one globule. To effect this, I take a little piece of pure test silver and rub the floured mercury; it will amalgamate onto the silver and can be rubbed off with the fingers, and added to the other. After collecting all of the mercury, I dissolve both the mercury and silver in nitric acid, and collect the gold on a filter for future fire-assay.

I next sieve the tailing under water on a 100-mesh sieve; finally washing them with a little clear water

which I add to the slime. I then dilute the slime up to about the original volume and allow it to rest for a period of five minutes, to settle out the heavy fine silicates, and decant the slime into another larger and clean receptacle. This operation I repeat about three times, using additions of clear water for the purpose of floating all of the fine suspended slime. The different products can now be dried, weighed, and assayed. It is usually advisable to still further separate the coarse sand that was retained on the 100-mesh sieve into several grades by means of a series of coarser sieves before assaying them; weighing out and estimating the exact percentage of each different grade of material of which the sample was composed. The total weight will give a basis for estimating the percentage and value per ton of concentrate, and the recovery per ton in free gold. The product passing a 100-sieve and settling in five minutes contains mineral that should mostly be concentratable on a canvas plant; it can be re-cleaned on properly adjusted vanners and brought up to a fair grade. The slime remaining in suspension for five minutes will yield considerable of its gold also on a canvas plant, if given a careful sizing to eliminate all heavy particles of the gangue material before treatment. But this slime is generally too fine to withstand the force of the wash-water on vanners and cannot be successfully re-cleaned; in some instances it will build up by adhesion on canvas to a high-grade product sufficiently rich for treatment; though the best scheme that I have ever found was to collect this fine mineral on submerged surfaces.

Now to return to the milling problem: If the coarse silicates are high, they evidently require finer crushing, but if the slime is the highest product it would indicate either hard amalgamation, base mineral in the ore that fouls the amalgam and renders it brittle, or that the ore is being over-milled. In case of the last the tailing will be lowered by using a coarser screen and lower discharge, with outside amalgamation.

If both the coarse particles and the slime are high, the ore should be twice crushed, followed in both instances by amalgamation and concentration with the additional adjunct of an up-to-date canvas and slime concentrating plant.

WILTON E. DARROW.

Sutter Creek, California, August 27.

An Engineer's Guarantee.

The Editor:

Sir— I read with much interest your editorial in the issue of August 24 on the Zinc Corporation, and I quite appreciate your compliment to Mr. H. C. Hoover, who evidently faced the music like a man. It is true that a responsible engineer never guarantees the percentage of extraction, or the tonnage in sight in a mine, or other things that are in the nature of estimates, but surely it is not quite correct to say that he "never guarantees anything," for engineering consists largely in the accurate ascertaining of physical facts, and as to them he is expected to be held responsible. The depth of a shaft, the width of a vein, the assay of a particular ore, the cost of a machine, and such matters are outside anything in the nature of a guess or an estimate; an engineer is expected, and usually expects, to be held responsible for statements concerning them. While most of us will endorse the position of Mr. Hoover in refusing to guarantee the success of a metallurgical process, and approve of his courage before a meeting of shareholders, I think it right to demur to the sweeping statement that a responsible engineer never guarantees "anything."

B. M.

Oakland, August 29.

Hydraulic Mining in Cariboo.

Written for the MINING AND SCIENTIFIC PRESS
By DOUGLAS WATERMAN.

The Cariboo district, in British Columbia, has been known for its gold since the days of the Fraser river excitement. The early miners found their way into the rich diggings over the old trail, portions of which may still be seen by the traveler on the Canadian-Pacific, which skirts the opposite bank of the Fraser river canyon. The river bars and flats were worked with rocker and sluice-box, and by means of wing-dams the rich bedrock of the streams was exposed. Spring freshets have long since wiped out all traces of these wing-dams, which exhibited the ingenuity and resourcefulness of the pioneers, and it has been found that they did their work in a thorough and systematic manner.

Some years ago a company was formed to work the

from the old mining camp of Quesnelle Forks and about the same distance from the outlet of the great Quesnelle lake, about 190 miles by way of the 150-mile House, and about 170 miles by way of the 108-mile House and Horsefly from Ashcroft (on the line of the Canadian-Pacific railway). The journey is made at an easy grade over excellent roads, which, as far as the 150-mile House, are under Government supervision. The shorter route is used in winter, when most of the heavy freighting is done. On approaching the scene of mining operations the observer cannot fail to be impressed by the magnitude and extent of the ancient river-channels marked by valleys and a chain of lakes, and by the terrace gravel exposed along the road for miles. The mining leases of this company cover the auriferous deposits of this river system for a distance of 10 miles. The channel now being exploited parallels the south fork of the Quesnelle for two miles, from where it is first exposed by Drop



Gorge of the Quesnelle River.

bed of the Quesnelle river and a large sum of money was expended in the construction of a masonry dam at its head. When the gates were finally closed and the work of excavation begun, these old wing-dams were disclosed and it was found that the river for several miles had been completely stripped of its riches. With the passing of the white miner, the country was given over to the more frugal Chinese, who occupied the deserted cabins and with their rockers sought the best spots in the shifting sands of the river bars. It is noteworthy that the first hydraulic work done in the country was by a Chinese company, which uncovered the ancient channel now being worked by the Consolidated Cariboo Hydraulic Mining Co., Ltd., and recovered gold valued at \$900,000. This property, after passing into the hands of the latter company, produced for a period of ten years, from 1894 to 1904, \$2,457,669, an average yield of 9.9 cents per cu. yd. The Consolidated Cariboo mine is situated at Bullion on the south side of the south fork of Quesnelle river, four miles

gulch to the point where it finally breaks through the narrow ridge that separates it from the present river. The excavation begun by the Chinese company years ago has been advanced over 2,500 ft., exposing a deposit of auriferous gravel 600 ft. wide at the top, 300 ft. at the bottom, and 400 ft. deep. The face of the excavation shows 75 ft. of top gravel, under which lies 100 ft. of volcanic mud, the remainder being designated as bottom gravel. Owing to the indurated nature of the deposit, the face presents a nearly perpendicular wall which is attacked by undercutting. To protect the men and monitors from the dangerous caving of the ground occasioned by this method, the face is advanced in two sections, leaving a narrow strip of gravel between. The monitors are placed directly in front and close up to this 'toe,' which has the effect of deflecting the frequent caves which would otherwise prove most destructive. The bedrock of the channel is of sufficient elevation above the present river to allow of a bedrock sluice 1,200 ft. long

and a drop at the dump of 50 ft., which has proved sufficient, owing to the torrential nature of the stream, which carries away the tailing as rapidly as deposited. For the future working of the mine, a sluice tunnel 1,200 ft. long is required. At the time of the writer's visit in 1905 such a tunnel, 10 by 10 ft. in the clear, large enough to accommodate a sluice 7 ft. wide by 3 ft. deep, and a walk two and a half feet wide on one side for the sluice-tender, was under construction and had already been advanced 800 ft. No. 15 Gardner electric drills were employed in the work and had proved highly efficient. The distance driven per week was as much as 38 ft. in hard rock; the average cost during the season was \$12 per foot, a remarkably low figure. Power for the drills is obtained from one direct-current dynamo built by the General Electric Co., rated at 30 kw., full-load current 240 amperes at 125 volts, which also furnishes light to

includes two pooling reservoirs situated near the mine at the delivery end of the two main canals. They are utilized to collect the early spring water and to conserve the water contained in the canals after the head-gates are closed. Some idea of the cost of ditch construction in this district may be derived from the Morehead ditch, a canal 10 miles long with a capacity of 2,500 miner's inches of water, in which the average cost of excavation was 65c. per cu. yd., rock-work being figured at \$1 per yard. The cost of flumes was \$18,000 per mile and the average cost of canal per mile, including flumes and waste-gates, was \$8,000.

The present water supply has proved inadequate for the economical working of the mine, and there is under construction a canal and pipe line to tap the waters of Spanish lake, which will insure an abundant supply throughout the working season of seven months. It may be of



Cariboo Hydraulic Mine.

This photograph and the one on the opposite page should be contiguous as they represent a single view, the ridge between the river and the mine is shown to the left of this illustration and to the right of the one preceding.

the mine and camp. By the use of electricity instead of oil for lighting a saving of 70% is effected.

The method of working in two sections necessitates two lines of sluices, which are 7 ft. wide by 4 ft. deep, paved in part with ordinary wood blocks one foot thick, and by improved longitudinal steel riffles. Sluices are not curved at the turns or at the cut-in, but a drop-off of from 4 to 6 in. is provided, which accelerates the material sufficiently to prevent the clogging of the sluice. The sides exposed to the impact of the boulders are protected by end-blocks laid flush. The grade of sluices is nine, eight, and seven inches. The water is obtained from three lakes, with a storage capacity of 1,016 million cu. ft., through 33 miles of well-constructed canals capable of delivering 5,000 miner's inches under 420 ft. head. The average duty of a miner's inch of water is 4.9 cu. yd. of gravel removed per 24 hours. The watersheds drained by the lakes and canals aggregate 59.4 square miles. The system also

interest to note the relative efficiency of different classes of labor employed in ditch construction:

Chinese.....	4 cu. yd. at \$1.75 per day	33.75c per cu. yd.
White men other than Swedes and Italians.....	9 " " 2.50 "	27.77c " "
Swedes and Italians.....	7 " " 2.50 "	35.71c " "
Japanese.....	6 " " 1.75 "	29.16c " "

A telephone system 35 miles long places the office and store in communication with reservoir and canal tenders, foreman of the hydraulic pit, sawmill, and blacksmith shop. This was installed at a cost of \$100 per mile with an annual expense for maintenance of about \$100. The wide and level spoil-bank of the ditches is planted with clover and timothy from which a crop of hay is harvested each season, providing winter feed for the company's live-stock. But the chief benefit derived from planting this kind of fodder lies in the fact that it effectually prevents the growth of willows, the roots of which are a constant menace to the ditch. From the pent-stock pro-

Metallic Sulphides in the Tuffs of Santo Domingo.

Written for the MINING AND SCIENTIFIC PRESS
By F. LYNWOOD GARRISON.

The copper deposits of the San Christobal district, in Santo Domingo, are found on the southeastern edge of the great mountain complex that constitutes the core or interior of this island, about 25 miles northwest from the city of Santo Domingo. I was impressed by their unusual and peculiar character when I first visited them in the winter of 1905, although at that time they were in an undeveloped condition. Finding some copper ore at the contact of an eruptive rock and the Cretaceous limestone, I naturally expected to see the usual accompanying contact phenomena. In this I was not altogether disappointed, as the limestone was found to be somewhat crystallized or marbleized near the contact. The copper minerals thus far have been found only in the eruptive. The best ore of the district is wholly in veins and pockets in the basic crystalline rocks first assumed to be dioritic, but since determined microscopically to be tuffs of an indefinite mineralogical character. This fact might explain, at least in part, the relatively slight degree of contact metamorphism exhibited in the aforesaid Cretaceous limestone. The copper minerals in the tuffs near the limestone contact are chiefly chalcocite associated with a preponderating proportion of limonite, some malachite and brochantite (a copper sulphate). As yet not the slightest trace of copper has been observed in the limestone, though a more careful and systematic search may be more successful.

In order better to understand the topic of this paper, it will be well to glance at the outline geology of Santo Domingo in particular, and the West Indies in general.

The genetic relations between the Greater Antilles and Central and South America appears to have been noticed first by Suess¹ and Von Seebach, who drew a parallel between the orographic structure of the European Mediterranean and American Caribbean basins, and demonstrated how the features that are dominant in one are representative in the other. Areas of long existing weakness in the earth's crust are recognizable in both regions, and the progressive disruption that took place over long geological periods still continues. Continental masses have been broken sectionally into these areas, and their fragments lie in part scattered about as islands of archipelagic seas; mountain chains have been sundered, disrupted, and drowned in the resulting oceanic troughs, though some of their higher pinnacles rise as islets from the abysmal depths.² Suess has shown in a masterly manner that where these great continental breakages take place they are associated with seismic or volcanic disturbances. The connection between the Antillean disturbances of the Miocene on the east-west trends and faulting in southern Mexico has been observed by Hill; the great active volcanoes of this part of Mexico being supposed to be due to weak spots or fissures caused by the crossing of the Cordilleran and Antillean trends.³ According to Heilprin⁴: "The boundaries of the region of weakness that is included within or touched by the Caribbean-Gulf basins may be roughly drawn from the western coast of Mexico to the Lesser Antilles, or over an east-and-west extent of 36° of longitude, and from the northern parts of South America to Porto Rico and the lower parts of the Mississippi Valley. Practically the whole of Central America is included in this region, whose area may be approximately put at

twice that which is represented in the Mediterranean region of Europe. Nearly the whole of this tract, and much of the region that immediately adjoins it, is characterized by violent seismic and volcanic disturbances, and probably no region of the globe, with the exception of that of the Molucca seas, has been witness to greater catastrophic events."

It is therefore evident that in studying Antillean geology one should be prepared to find extensive manifestations of past volcanic action, and such in fact is the case. Gabb, in his geological survey of Santo Domingo, noted the predominating influence of the intrusive rocks and considered them due to a series of eruptions extending from the late Cretaceous to post-Miocene times.⁵ The apparent scarcity of rhyolitic and basaltic rocks in Santo Domingo is notable; Gabb observed the absence of what he termed true volcanic rocks, consequently he could not have been cognizant of the existence of tuffs, which he appears to have considered "jaspery slates."⁶

Although volcanic activity in Tertiary times was great and extensive in the larger Antillean islands, no evidence exists of there having been any in the Quarternary period; in this respect these islands differ radically from the Lesser Antilles, where we have the yet active volcanoes of Pelée and La Soufrière of St. Vincent. The recognition of a close relationship between the Antillean geology and that of the neighboring continental areas was a brilliant generalization and a great step in advance. A consideration of their correlative economic geological relations would appear to be the next stage, but until we know much more of the countries thus affected it is impossible to go further than draw a few inferences of doubtful value, and it would seem well to avoid the question at present, confining ourselves to recording some facts that have come recently to notice.

The existence of gold in the streams of Santo Domingo, Cuba, and Porto Rico was known in the days of Columbus, and the copper deposits at El Cobre, near Santiago de Cuba, were operated by the Spaniards at a very early date, but with this exception no actual mining was done by them in America until modern times. In Santo Domingo for a number of years much gold was washed from the stream gravels, but no attempt was made to exploit any other mineral deposits, and it is doubtful if their existence was known.

Within the past ten years several efforts have been made to develop the promising copper prospects on the Nigua river in the San Christobal district of this island. For various reasons they have not been successful, although excellent ore carrying a considerable proportion of gold has been found in the veins or fracture-zones that traverse the great masses of hard tuff lying between the Jaina river on the east and the Nigua on the west. At least one such mineralized zone, running in a north-northeast direction for a distance of a mile or more, has been traced from the Nigua river. At the crest of San Francisco hill, which rises above the Nigua some four or five hundred feet, this zone begins with a width of about 30 ft. between its boundary walls, as shown in Fig. 1. Near the surface it is thoroughly decomposed into a chloritic friable mass, containing little or no copper minerals. About 150 to 200 ft. farther down the hill a section shows the zone to be split by intervening country rock. The decomposition here is slight and the mineralization greater; much quartz with some excellent chalcocite and bornite ores are found, but no chalcocite, which is disappointing, since it is evident the upper

¹ R. T. Hill, *Trans. A.I.M.E.*, Vol. XXXII, p. 172.

² *Ibid.*, p. 261.

³ "Das Anlitz der Erde," Vol. I, pp. 512, 514, 519.
⁴ Angelo Heilprin on the volcanic relations of the Caribbean basin ('Mont Pelée and the Tragedy of Martinique,' Phila. 1903, p. 257.)

⁵ "Topography and Geology of Santo Domingo," by Wm. M. Gabb, *Trans. Am. Philosophical Society*, Vol. XV (1872), p. 90.
⁶ *Ibid.*, pp. 89 and 190.

portion of this zone or vein has been thoroughly leached and a re-deposition of the copper salts might be expected at this point. As is frequently the case in copper veins, the gold content is apt to be greater near the outcrop than in the less oxidized portions of the deposit. The outcrop on the surface of the mountain shown in the photograph (Fig. 1) is altogether barren; the maximum amount of gold appears to be in those parts of the zone or vein where the sulphides have been altered to the oxy-carbonates—malachite, azurite, etc.—and does not vary with the ratio of copper. The gold ranges from as high as \$7 per ton, while the copper content in hand-picked ore averages from 5 to 15%. Near the limestone contacts the bornite disappears entirely and the gold drops below one dollar per ton, whereas the proportion of silver shows a slight, and the iron a great, tendency to increase.

The tuff, in which these copper minerals are found, possesses some notable characteristics.⁷ When exposed



Fig. 1. On San Francisco Hill.

to weathering, as on the top of the hills, it decomposes readily into a soft clayey material that near the veins contains a large proportion of epidote and chlorite. When unaffected by atmospheric decay, as in the stream-beds where mechanical erosion has kept the surface fresh and clean, this tuff is excessively hard, dense, and breaks with a broad conchoidal fracture; it possesses varying shades of dark gray, green, and purple tints.

This coloring is decidedly peculiar; the bands of different shades range from a few inches to a foot in width and often extend entirely across an exposure. They are not uniform in width, sometimes they end abruptly, taper out, or widen, and enclose areas having the characteristic color of the surrounding rock. The lines of demarcation between the differently colored bands are straight, regular, and very sharp. These tuffs possess a fairly uniform system of fissures, frequently so regular as to resemble stratification, but others equally well marked cross them in entirely different directions; sometimes several systems of fracture occur together. The mass in the bed of the Nigua river shown in Fig. 2 exhibits this

characteristic fissuring, and also possesses the varicolored banding above mentioned, but it was impossible to indicate it in the photograph. The general trend of the tuff masses at this place is to the northeast, with an apparent dip to the south. The ore-bearing zones have a similar strike and dip; and if they can be assumed to have any regularity in strike, it is to the northwest. Cross-zones or veins with a northwest and southeast trend also occur, and it is at their intersection that the best ore is likely to be found.

Perhaps the most notable characteristic of these tuffs is the presence in them of large segregations of epidote. When exposed to the atmosphere these clusters decompose faster than the rock-mass, leaving pits or holes about the size of a walnut, as is shown in Fig. 3. When the same rock is under water in the stream, the body wears away faster than the epidote clusters, leaving them protruding from the mass as lumps or bosses.



Fig. 2. In Bed of Nigua River.

From this it is evident that the tuff is either softer than the epidote or more soluble in water. Examined under the microscope the transition of the tuff into almost pure epidote is exceedingly sharp, there being no grading or intermediate stage. This fact is perhaps suggestive of the origin of these epidote aggregations, accepting the hypothesis that the tuff was originally in a plastic or semi-plastic condition, and contained gas or air bubbles that produced globular or vesicular cavities in which the epidote collected and crystallized. It seems curious, however, that the filling of such cavities appears to be exclusively of epidote, though it might be well, in the absence of a much more extensive examination of the region, to assume this is not always the case. The fact remains, however, that except in one instance where quartz was observed filling some small globular cavities, no other mineral has yet been found in them. The microscopic structure of this tuff is shown in the microphotographs Fig. 4 and 5, the former being a typical example of the rock itself, while the latter is a section of a small quartz vein in the tuff. In Fig. 5 the dark mottled segment in the upper part of the figure is tuff, that is, the country rock. The line of demarcation between it and

⁷Gabb considered these tuffs to be altered sedimentary rocks and refers to the occurrence of similar deposits in Jamaica. *Loc. cit.* p. 190.

the quartz vein is sharp. The darker shadings in the quartz itself are mostly chlorite with some malachite, and the dense dark mass in the lower right-hand corner is limonite. Although the dividing line between the tuff and the quartz vein is well defined, the country rock is filled with green chlorite for a relatively long distance from the vein. This mineral is intimately associated with the particles constituting the rock, and is undoubtedly due to its alteration. It seems probable that the copper minerals themselves are due to secondary concentration, at least in part.

These tuffs are often cut by basic dikes of a basaltic or diabasic character, as shown in Fig. 6, which is the photograph of a rock in the bed of the Nigua river near San Francisco, in the San Christobal district. It is evident that the dike material must be softer or more soluble in water than the enclosing rock, as the dikes are some six or eight inches below the surface. The microscope shows this dike material to be composed of lath-shaped feldspars with some augite, the mass being sprinkled or peppered with fine grains of magnetite⁸.

In this neighborhood, the tuffs are sometimes associated with rhyolitic porphyry containing phenocrysts of

in the case of the iron ore deposits of the Crystal Falls district, in Michigan.¹⁰ Here the tuff deposits are grouped under the term 'pyroclastics of the Hemlock formation,' and include breccias and dust accumulations of both eolian and aqua-sedimentary origin; that is, the dust deposits may have been formed in the air, drifted into heaps by the wind, or laid down in water as a semi-stratified formation. A more common condition was probably that of mud, the condensed steam from the volcano mingling with the dust, thus forming the great mud flow so often witnessed in modern volcanic eruptions. The hardening of this material produced rocks of a basic or acid character, as determined by the proportions of silicious and alkaline bases. In the case of the Crystal Falls deposits, which are of pre-Cambrian age, both the tuffs and breccias are basic.

A tuff is usually regarded as a rock or deposit composed of the finer fragmental ejections from explosive eruptions of volcanoes, the coarser material being denominated, when consolidated into masses, volcanic breccia or agglomerate. Some confusion appears to exist regarding the correct definition of the word 'tuff,' and it is not a satisfactory term when applied to certain classes

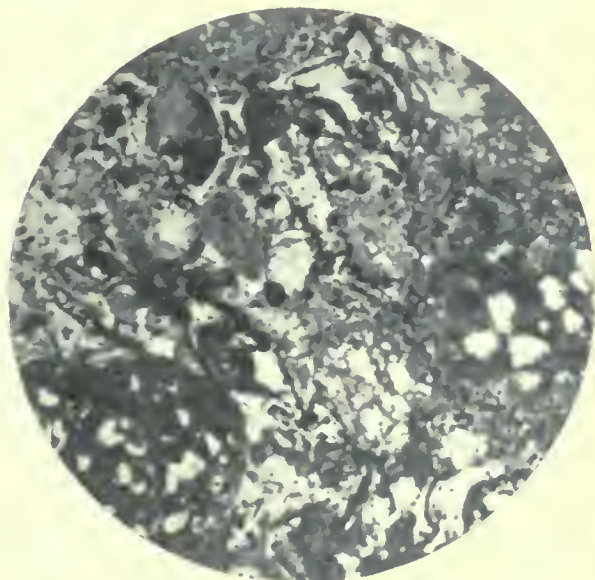


Fig. 4.

orthoclase and quartz, but it is not clear whether these particular rocks are associated with the ore deposits or have played any part in their genesis. As previously intimated, it is notable that ore deposits of approximately sufficient size to be workable should be found in tuffs, as they are not usually regarded as ore-bearing rocks. Taft, in his remarks upon the Bullfrog district in southern Nevada, observes:⁹

"The older tuffs are mineralized, and the more recent (upper) are not; the older are basic, while in the upper there is a flow of rhyolite. At Tonopah it is quite noticeable that the rhyolite is more recent than the 'mineralized porphyry.'"

It is evidently an error to assume, as has been done, that tuffs are necessarily a semi-solidified volcanic dust or scoriaceous material, and cannot exist as hard, dense rocks, sometimes ore-bearing, and probably playing an important part in the genesis of the orebodies contained in them and in other associated rocks of an entirely different character. While the importance of this subject does not appear to be generally recognized, its bearing in certain specific cases has been clearly understood, as

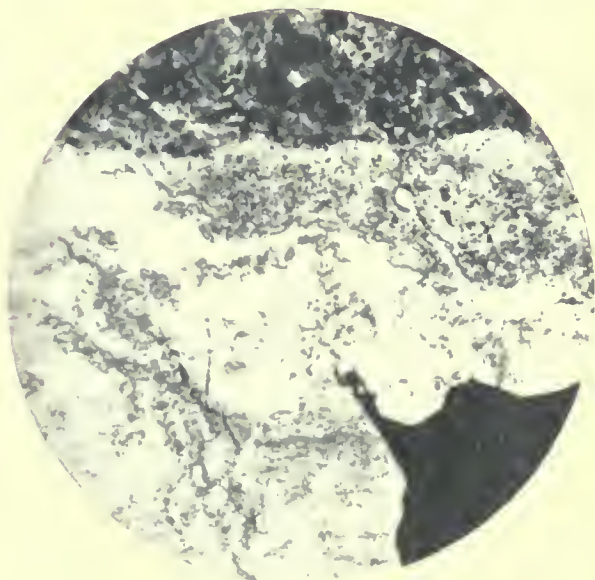


Fig. 5.

of volcanic rocks for which we appear to have as yet no better name, except the general indefinite expression 'pyroclastic.' Moreover, the word 'tuff' is often confused with 'tufa,' which is usually and correctly understood to be a material deposited by the solfataric action of hot water or steam. A mud composed of volcanic ejectamenta or dust may resemble similar material deposited by geysers and mud springs, but it appears highly probable that they have different origins, and should not be confused. For practical purposes, therefore, the word 'tuff,' in want of a better term, may be applied to more or less consolidated deposits composed of finely powdered volcanic fragments or dust. The consolidation may be the result of pressure, the cementing action of accessory material such as silica, and iron oxide, or a combination of these and other agencies. It is also conceivable the ejected fine particles of mineral matter may be in a sufficiently highly heated condition to be plastic or soft and to stick together, thus forming a spongy mass that subsequent pressure could weld into a solid rock.

⁹Trans. Am. Inst. M. E., Bulletin 6, Nov. 1905, p. 1,287.

⁸The writer is indebted to Mr. F. J. Keeley, of Philadelphia, for the preparation and identification of the microscope sections used in this paper.

¹⁰The Crystal Falls Iron-Bearing District of Michigan, by J. M. Clements and H. L. Smyth. U. S. Geol. Surv., 19th Ann. Rept. (Pt. III), p. 50.

The fact that ore deposits of commercial value may be found in indurated tuffs has not yet been generally recognized. H. H. Taft, in writing of certain gold deposits in southern Nevada, observes¹¹: "It is remarkable that so many mines have been found of late years in the volcanic tuffs, now generally known as andesite. A very large proportion of them carry gold. One cannot but wonder if there are not more. This is not a formation which prospectors have liked until lately; and as yet it has been but imperfectly studied. The fact that the mineral-bearing tuffs are basic, and are overlain by the acid rhyolite, is perhaps significant."

J. E. Spurr, in his monograph on the Tonopah district, Nevada,¹² calls attention to certain ore-bearing tuffs in Japan. Reference to the Japanese authorities develops the fact that there are a large number of localities, especially in northern Japan, where gold, silver, and copper in apparently workable quantities exist in tuffs, usually associated with Paleozoic rocks.¹³ These Japanese tuffs are associated with andesitic and rhyolitic flows, chiefly of the Tertiary period; the ore deposits, or aggregations of metallic minerals, appear to be chiefly or wholly in tuffs of a basic character and consist mostly of chalcopyrite, bornite, argentite, with occasional galena and zinc-blende.

At Potrillo, in the State of Durango, Mexico, cassiterite occurs in rhyolite-tuff along fault-planes in aggregations or nuggets, and occasionally in bands of crystalline minerals replacing the country rock between two sheet-planes. Other tin orebodies of less importance are found as ill-defined replacements of the country rock and there is some evidence that the source of the tin of this district existed as an original constituent of the country rock.¹⁴

Going west into California, we find that the greenstones of the Mother Lode gold deposits, although recognized as of sedimentary origin, are in fact derived from tuffs and eruptive detritus.¹⁵

These references might be multiplied were it necessary to further elucidate the subject; the close relationship of such consolidated volcanic ejectamenta to ore deposits and their effect upon the genesis of orebodies, whether in tuff itself or in associated rocks of different construction, is evidently a subject worthy of consideration, and one that appears to have been little understood in the past, or perhaps, what is more probable, such tuffs were classed as other kinds of rock, their actual structure being misunderstood. This is probably due to the fact that the finer tuffs are often so silicified as to be undistinguishable from massive rocks, except under the microscope.¹⁶ Rickard, in speaking of veins in andesite at Cripple Creek, does not distinguish between tuff and fine-grained andesite, which he says in the vicinity of the lodes is impregnated with the quartz to such a degree as to obscure its fragmentary character, and make it resemble phonolite.¹⁷ Purington similarly refers to the San Juan breccias of the Imogene basin, in Colorado, as andesite. He describes it as containing fragments of andesite, generally angular, in a tuffaceous matrix whose origin is igneous, and water-laid. It is extensive in the San Juan mountains (Colorado) and at its horizon most of the present productive mines of the district are situated.¹⁸ It is evident, therefore, that tuffs vary according to the character of the magmas from which they were derived in the volcano. Thus, in a region of basalt we have basaltic breccias

and tuffs; likewise in andesite, such rocks would have an andesitic nature, and so on.

Coming now to the consideration of the origin of the ore deposits that are the subject of this paper, we are confronted with some facts difficult to understand.

The ore deposits on the Nigua river may, for convenience, be divided into two groups. Segregations of copper minerals in tuffs on Bocara hill near a limestone contact, and veins or fissure-zones on San Francisco hill. The deposits of this last group can be traced in a northeasterly direction toward the Jaina river, a distance of three or four miles. On Bocara hill the ores appear to be magmatic segregations, and not veins, fracture-zones, or deposits in pre-existing cavities. The copper minerals seem to be localized in spots in the country rock. On the surface of the hill, where there has been much weathering and little erosion the mineralized segregations, being harder than the tuff, stand out in relief, in one instance forming a kind of blow-out. Lower down the hill (Bocara) where the rock has not been so much weathered, or at least where the products of decomposition have been eroded, the mineralized spots or streaks have the appearance of veins, but they are discontinuous and erratic in occurrence. The rock surrounding them is intensely hard and difficult to work. From a boulder dug out from the decomposed tuff on the top of the hill, an analysis was obtained, showing 8.17% chalcopyrite; 26.34, malachite; 24.53, limonite; 24.78, quartz; 16.18, chlorite, and other silicates undetermined. This gives us an equivalent of about 17.95% copper and 17.20% iron.

If it is assumed that the copper minerals were aggregated when the rock was in a fluid or semi-fluid condition, we are confronted with the fact that in the nature of things a tuff, that is, a dust or fragmentary deposit, could not have been in such a condition after its deposition without the destruction of the fragmentary structure by fusion, which is not the case in this instance. The nearest state to this condition we might reasonably assume would be that of plasticity or semi-fluidity to a point short of an actual fusion of the individual particles composing the mass. The question then arises, could a segregation of metallic sulphides take place under such a condition? It is difficult to conceive how it could, unless there might be some sort of molecular flow or diffusion in accordance with Soret's principle of molecular concentration caused by differences of temperature. This hypothesis assumes that in a homogeneous solution unequally heated in different parts, concentration will be greatest in the region of lowest temperature.¹⁹ Of course, a rock of this kind is not a homogeneous body, and as it is not a solution we cannot assume the existence of osmotic pressure, as suggested by Park in the case of molten magmas.²⁰ It would therefore appear that the most plausible hypothesis to account for these segregations of metallic mineral would be the action of water or aqueous vapor. In the absence of cracks, seams, or ducts in the tuff, by which such an aqueous medium could travel, there seems to be left only an assumption of capillary circulation.

A disposition appears to exist of late to discredit the lateral secretion theories of Sandberger and assume in economic geology that the valuable metallic minerals necessarily come from the indefinite 'below,' just as in old-fashioned theology all good was ascribed to an equally

¹¹ *Trans. Am. Inst. M. E. Bull.* 6, Nov. 1905, p. 1298.

¹² Professional Paper No. 42, U. S. Geol. Sur. (1905), pp. 281-283.

¹³ 'The Mining Industry of Japan,' by Wada Tsunashiro, The Mining Bureau, Tokio, 1893; Geological Survey of Japan, Tokio, 1902, pp. 18-19, 121-177.

¹⁴ W. B. Ingalls. *Trans. A. I. M. E.* Vol. XXV, (1895), p. 154.

¹⁵ Prichard, 'Observations on Mother Lode Gold Deposits, California,' *Trans. A. I. M. E.* Vol. XXXIV (1904), p. 462.

¹⁶ Rickard, 'The Cripple Creek Volcano,' *Trans. A. I. M. E.* Vol. XXX, p. 363.

¹⁷ 'The Lodes of Cripple Creek,' *Trans. A. I. M. E.* Vol. XXXIII (1903), p. 591.

¹⁸ 'Camp Bird Mine, Ouray, Colorado,' etc. *Trans. A. I. M. E.* Vol. XXXIII (1903), p. 504.

¹⁹ 'On the Cause of Border Segregation in Some Igneous Magmas,' by James Park. *Trans. Inst. Mining & Metallurgy.* Vol. XIV, p. 537.

²⁰ *Ibid.*, p. 538.

intangible 'above,' with as much sense in one case as in the other. Possibly some persons familiar with the volcanic rocks of the Great Basin in Nevada, Arizona, California, and Mexico, have observed in places the remarkable—almost universal—existence in them of traces of gold. De Kalb, in speaking of the pegmatites at the Exposed Treasure butte near the Tehachapi mountains in the Mojave desert, California, observes: "It is worthy of note that these pegmatite dikes rarely show, by samples taken at random, a value in gold lower than 20c. per ton, and many of them, particularly in the Rosamund mountains, often assay as high as \$1 per ton. The granite itself is never barren, but seldom carries more than 0.001 oz. gold per ton. The absolutely universal dissemination of gold throughout all rocks in the entire district, requiring no refined methods of analysis to determine its presence, is a noteworthy circumstance."²¹

In Mohave county, Arizona, I have myself found traces of gold in pegmatite, schist, gneiss, basalt, diorite, rhyolite, trachyte, and tufa, all within an area of ten square



Fig. 3. Pitted Tuff.

miles. There are also to be found at this place (Weaver district) rich superfluvial deposits of gold-quartz ores, mostly oxidized but with occasional specks and spots of sulphides, having no apparent connection with any deep-seated vein or duct; the veins are nearly horizontal, or but with a slight dip to the east. In the absence of proof to the contrary, one is forced to the conclusion that these deposits had their origin by lateral secretion and leaching of the surrounding rock.

Referring again to Bocara hill, on the Nigua river in Santo Domingo, repeated efforts to find bodies of ore large and rich enough to work have failed, and the only promising deposits so far prospected are the fissure-zones or veins on San Francisco hill, fully a mile distant and about half a mile from the nearest limestone outcrop. The ore in these fracture-zones (as I prefer to consider them) is rich and carries gold, and if found in quantity would make a valuable mine. The great fissure or fracture-zone at this place is more or less regular, but the mineralization is uncertain and discontinuous, the ore-body or pay-streak suddenly stopping and pinching out

in a most unexpected manner. The parting, or separation of the vein from the country rock, is also indistinct and in many places it could be said that there are no vein-walls, the ore shading into the rock. From the indications here it would seem that the original vein-filling or mineralization had a deep-seated origin, subsequently enriched by a downward leaching and re-disposition of the copper, since the ratio of this metal increases with depth, while the proportion of gold is greatest in the partially leached portions of the vein nearer the outcrop. This observation as to the greater proportion of gold near the outcrop, in the case of copper deposits, has been repeatedly noted, especially in fissure veins. When the oxidized, or upper parts of orebodies have been removed by erosion, as in Alaska, the sulphide zone is practically at the surface, and there has been no time for leaching and re-precipitation at lower levels, owing to the steady

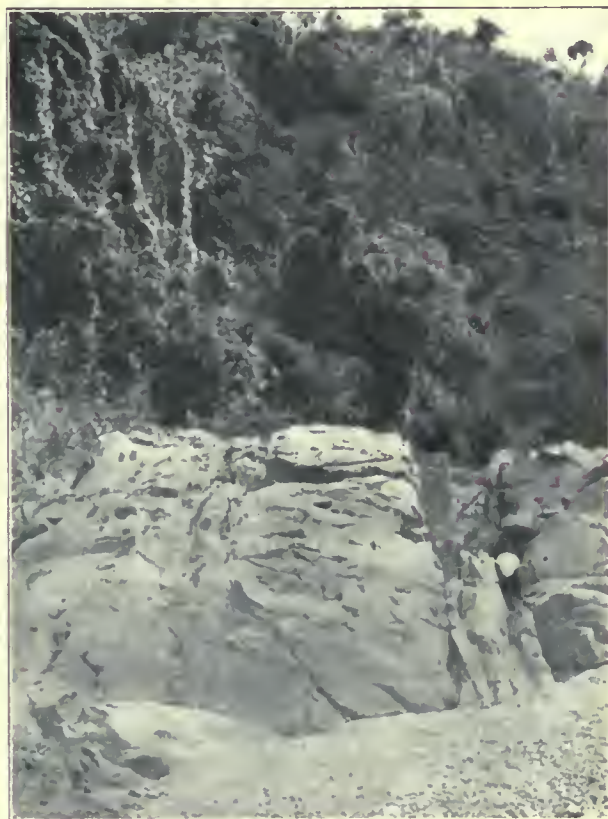


Fig. 6. Dike Cutting Through Tuff.

removal or planing down of the outcrop by ice and other destructive agencies.

The genesis of the fissure veins, or zone deposits, on San Francisco hill, may be safely assumed to have combined in their origin lateral secretion, re-precipitation of solutions from the outcrop, with some proportion of metal from a deep-seated source.

Although the lines of demarcation between the vein and country rock is not always distinct, and there are frequent evidences of a metasomatic replacement of the rock by the copper minerals, while the veins are at times distinctly defined, as in the microscopic section shown in Fig. 5.

I can see no reason why an ore deposit in tuff rock should not have an origin similar to one in a solidified magma. For example, the constituents of an andesitic tuff must be practically the same as an andesitic magma, and if the metallic minerals were derived from the body of the enclosing rock, the results must be similar in either case. If the metal-bearing solutions came from greater depths than the enclosing rock, or even if they were derived from lateral secretions, there is no reason to suppose the fissures in a magma would offer a more

²¹ *Trans. A. I. M. E., Bulletin 13, p. 17. Jan., 1907.*

hospitable or favorable site for deposition than the crevices in the hard, dense, consolidated tuff. I am of the opinion that ore deposits cannot usually be ascribed to any one set of phenomena, but to combinations of forces acting together and separately at different intervals. It is a mistake to assume that any one particular agency has been the sole and only medium of deposition; in fact, I doubt if this is ever the case. Ore deposits as we find them are the finished products of Nature's great laboratory, with its multitude of forces and complex systems of construction and destruction, still going on upon the surface and in the interior of the earth. Gradually we learn something about them and by turning this modicum of knowledge to practical account we have evolved the science of economic geology, which is geology, chemistry, and physics applied to practical mining. But such tools can be safely used only by a trained hand and mind; how dangerous they are to the unskilled is to be seen today in every mining camp.

DIAMOND-CARBON IN METEORITES.—The results of careful researches on the Canyon Diablo meteorite showed (1) that it is only in certain specimens of this meteorite that carbon appears at all; (2) that in some pieces it is present in several forms, as amorphous carbon in two or three distinct varieties, as graphite, and as diamond in two varieties, black and transparent; (3) that these latter are found inclosed in or surrounded by a zone of amorphous carbon and in small fissures which stand in close relation to nodules of troilite and other compounds containing phosphorous and silicon in addition to the sulphur. Microscopic examination shows that even the portions of the iron that appear homogeneous frequently contain small nodules of this character. The metalloids—silicon, phosphorus, and sulphur—all tend to displace the carbon from molten iron, and an increase in the proportion of nickel, which is found to vary considerably in different parts of the meteorite, lessens the solubility of carbon in the alloy as compared with pure iron. These two conditions, therefore, should co-operate to favor the separation of carbon in such a meteorite. A series of new experiments was made to test the effect of conditions thus modified, with the general result that the addition of small quantities of monosulphide of iron, or of silicon, to the crucible of melted iron with carbon, on its removal from the electric furnace and just before its immersion in cold water, appeared to facilitate the production of minute diamonds. The addition of a small percentage of nickel, on the other hand, produced no apparent change from the results with pure iron. The introduction of phosphate of iron not only failed to increase the quantity of diamonds but apparently lessened it. Therefore it was concluded that the diamond-carbon in the Canyon Diablo meteorite has probably been set free from an iron carbide by the action of sulphur, and to some extent of silicon, the latter having also partly united with the carbon to form the silicon carbide in association, the natural form of the artificial product carborundum. In a number of instances the little crystals broke spontaneously days or even weeks after their formation, thus presenting a striking parallel to the occasional behavior of diamonds from the blue ground of South Africa.

MINING for beryl has been carried on more or less extensively in North Carolina, but without much result. It has been found, however, in the Spruce Pine region that by deeper mining blue beryls are frequently obtained at a greater depth than any previously taken out, and in some quantity. Many gems have been obtained weighing from three-fourths of a carat to two carats each, but few are over four carats in weight.

The Prospector.

Enquiries sent to this department are answered free of charge, if submitted by subscribers who are not in arrears. The full name and post-office address of the sender must be given, otherwise no answer will be made. Those who are not subscribers must accompany their questions with a fee of \$3 for each question. No assays are made.

A piece of Andesite was sent from Oaxaca, Mex., by H. A.

A fragment of Gabbro was sent from Silver Star, Mont., by C. L. D.

The rock from W. W. G., of Comer, Ore., was reported as an altered Andesite some weeks ago.

The two specimens from H. A. Mc., of Rebel Creek, Nev., are: No. 1, Pyrite and Molybdenite in quartz; No. 2, Quartzite.

W. L. G., of Fairview, Nev., sends: No. 1, Andesite; No. 2, Andesite; No. 3, Basalt; No. 4, Andesite; No. 5, Rhyolite; No. 6, Dacite.

The specimens sent from San Diego, Cal., by B. C. are: No. 1, Quartzite; No. 2, Pegmatite; No. 3, fine-grained Granite; No. 4, Pyrite.

W. L. R., of Victoria, B. C., sent a specimen of Tremolite, carrying andradite garnets and a vein of magnetite which is stained with red hematite.

The specimens sent from Mocorito, Mex., by R. M. H., are: No. 1, Dacite; No. 2, Andesite; No. 3, Calcite; No. 4, Andesite; No. 5, Andesite; No. 6, Andesite.

The rock specimens sent from Tonopah by R. C. N. are: A, Dacite Porphyry; B, Dacite Porphyry; C, Andesite; H, Dacite Porphyry; K, Dacite Porphyry.

G. B. sent from Buckeye, Ariz.: No. 1, Sepiolite; No. 2, Epidote; No. 3, Granite; No. 4, Siderite; No. 5, Quartz stained with iron; No. 6, Granite; No. 7, pegmatite Granite; No. 8, Andesite.

The specimens from L. B., of Kerby, Ore., are: No. 1, Serpentine with a bluish stain due to iron; No. 2, Mica Schist; No. 3, Actinolite; No. 4, Glaucophane Schist; No. 5, Diorite. The serpentine shows no indications of copper.

The specimens sent from Blair, Nev., by C. S., are: No. 1, Pyrite; No. 2, Quartz; No. 3, Quartz and Limonite stained with malachite; No. 4, Gatenite in quartz; No. 5, Pyrite in quartz; No. 6, Quartz and Arsenopyrite; No. 7, Gabbro; No. 8, Calcite; No. 9, Obsidian.

PYROPE IN NEW YORK.—An interesting discovery of pyrope garnet was made in constructing the rapid transit tunnel from the south end of Manhattan island to Brooklyn. This tunnel runs from the Battery at the foot of Whitehall street to the foot of Joralemon street, Brooklyn. About 1,000 ft. south from the New York starting point beautiful grains or nodules of pyrope were obtained, capable of being cut into gems of three-fourths of a carat to one carat in weight. These were in connection with serpentine—some of the green precious variety—together with kerolite. Pyrope is a mineral belonging to igneous rocks, especially peridotites, from the alteration of which serpentine is frequently formed. The serpentines of New York and vicinity are now quite clearly shown to have originated in this way.

Arbitration: Compulsory and Voluntary.

*In all the three States of Australia where Compulsory Arbitration Acts are on trial the principle has broken down so badly in actual working that its advocates can now claim for it virtually only one merit. They can say that, whatever may be its defects, a Compulsory Arbitration Act does place one barrier, albeit a frail one, in the way of settling industrial disputes by the summary methods of strike or lock-out. There is undoubtedly some force in that contention, although, so far as strikes are concerned, the barrier has proved so frail as to be practically worthless; and although compulsory arbitration, when it is successful in this respect, leads to other evils that outweigh the value of its success. As with nations, so with classes, the ultimate arbiter of disputes is, and must always be, force—war in the one case; strike or lock-out, or boycott, or something equally drastic, in the other. But as with national, so with industrial disputes, it is possible to place barriers in the way of a resort to force; and the stronger and more efficacious these barriers can be made, the better it will be in the long run, not only for the disputants themselves, but also for others not directly involved as parties in their dispute. Compulsory arbitration having proved ineffective as a barrier in industrial disputes, the question naturally arises whether something better and stronger cannot be devised and substituted for it.

Now historical teaching, practical experience, and common sense all show that such a barrier, to be really effective, must be constructed of the two materials: compromise and arbitration. Keeping that fact in view, and by way of clearing the ground for an answer to the above question, we may briefly point out the reasons, which we have already fully dealt with in previous articles, why compulsory arbitration has failed; and then we shall be able to see more clearly how what is faulty in it may be remedied.

First, then, the element of compulsion in the existing Acts is fatal to their success. There is an old adage that you can bring a horse to the water, but you cannot make him drink. Just so, you may force men into the Arbitration Court, but you cannot make them abide by its decision. The award once given, the Court has no power to enforce it. It may be argued from this that the Acts are not compulsory enough; that the Court should be able to punish men for the non-acceptance of any award, just as a magistrate can send a thief to prison for stealing a watch. But that can never be. No power could make an employer carry on business under conditions that would mean his financial ruin, nor can any power make a man work for a specific wage against his will.

So long as an award is accepted by both sides and work continues under it, the Court has power to punish either side for any breach of that award. But it has been shown over and over again in practice that the Act is so one-sided in its application that, while the penalties prescribed for a breach of the award are readily recoverable from the employer, they either cannot be enforced against the employees, or can be recovered from them only with considerable cost and difficulty.

Another aspect of the one-sided operation of the Act is seen in the fact, to which we have already alluded, that, when an award is given, if it meets wholly or substantially the demands of the workers, they are quite willing to accept it; if, on the other hand, it fails to satisfy their requirements, they at once cease work, and revert to the old method of a strike to get what they want. We do not, of course, say that they do this in every case, but

they have done it in so many instances that such action has become almost a recognized rule. The ordinary working man, in fact, whether as an individual or as a collective trades union, looks upon the Arbitration Court, not so much as a responsible court of law whose decrees are to be respected, but rather as an institution established by Parliament at the bidding of the Labor members for the express purpose of giving to the workers higher wages or shorter hours, whenever they choose to ask for them. As long as its decisions are adverse to the employer, the Court is doing its proper work and its decisions are to be loyally accepted; but when they are adverse to the employees, the Court stands self-condemned of failure, its award may be challenged as unjust and arbitrary and tyrannous, and may be rightfully and with impunity disregarded in favor of a strike.

It may be urged that it is open to the employer to act in like manner. If he is dissatisfied with an award, there is nothing to prevent him from closing down his business and discontinuing his industry. This is perfectly true; but the cases are by no means parallel. There is all the difference in the world between the throwing down of their tools by a number of workmen and the stoppage of a whole industry by an employer. Such stoppage means ruin to the employer himself, probably also ruin to a thousand workmen for a hundred affected by the award, and great inconvenience to the public. If in consequence of an award adverse to them, some of his men go out on strike, he can still carry on his business, though hampered and embarrassed, and trust that he will gradually replace the strikers by men willing to work under the terms of the award. But, on the other hand, sooner than close down his industry altogether and sacrifice the capital he has invested in it, he will submit to almost any exactions on the part of the Arbitration Court.

In such circumstances it is only natural that the employer should seek to make good in some way or other the loss he has sustained by an adverse award. The most obvious, and, consequently, the usually adopted course, is for an employer to put up the prices of what he produces, and so to compensate himself for the enforced payment of higher wages. The result, as seen in New Zealand, is inevitable; the increased wages will in the long run not benefit the workmen at all. In New Zealand, as we have noted, the Compulsory Arbitration Act has been comparatively successful, by which we mean that its working has led to less open friction in New Zealand than elsewhere. And what has been the result? An official report issued about a year back by the Secretary of the Labor Department in that colony draws a very gloomy picture of the state of affairs. He emphasizes the fact that Arbitration Court awards have increased considerably the wages paid to workmen; but at the same time he points out that the cost of all necessities of life has increased in a still greater ratio. It therefore follows that the enhanced wages now paid to workmen have not as large a purchasing power as the lower wages that previously ruled, and, consequently, to quote Mr. Seddon, "the workmen are no better off."

An examination into the working of the Compulsory Arbitration Act in New Zealand or elsewhere makes only too clear the fundamental fallacy that underlies and undermines it. The Act is based upon the fallacious assumption that the natural law of supply and demand can be superseded at will by the artificial law of the statute book; that the State can, by passing an Act of Parliament, at any moment fix for a definite time the relative value of two commodities, work and wages. Precisely the same fallacy has always wrecked every attempt to put into practice the theory of bimetalism, for no

* From the *Journal* of the Chamber of Mines of Western Australia. April, 1907.

government yet has found itself able to establish arbitrarily a fixed ratio between the values of the two commodities, gold and silver. Similarly, no court can establish, with any degree of satisfaction, a fixed ratio between work and wages. A legal authority pointed out in this journal some time ago that in cases involving the relations of employer and employee the tendency of judges nowadays was to favor the latter at the expense of the former. So it has been with the Arbitration Court. It is a simple fact that in almost every case brought before these Courts wages have been fixed at too high a rate. The result has been inevitable. The employer, to recoup himself, has been forced to raise the price of the product of the work for which he has been compelled to pay a higher wage. He has thus restored the equilibrium of supply and demand so far as he is personally concerned, but in so doing he has disturbed that equilibrium elsewhere. The natural result has been that the prices of other commodities have been forced up, wages have risen in other branches of industry, the cost of living has been increased all around, and yet nobody benefits. Not even the workmen benefit by the increased wages they get, for the purchasing power of their wages remains the same as it was before. The State—and with the State every member of it—suffers by this condition of affairs, for, with the cost of production enormously increased, the State is seriously handicapped in its competition with other nations for the sale of its products in the markets of the world.

Before leaving this phase of the subject we may note that there is one industry alone in which the employer is debarred from raising the price of his product in order to compensate himself for the payment of higher wages. That industry is gold mining. Gold is the universal standard by which all commodities are valued, and therefore its price is theoretically unalterable. The theory is not quite true. The truth is that the value of gold—its purchasing power—has steadily depreciated and is depreciating, but the alteration in its value is so steady and so slight from year to year that for all practical purposes it may be, and is, regarded as unaltered. Hence, when the wages of miners are raised the owners of gold mines cannot resort to the obvious remedy open to other employers, and their power of recouping themselves for exactions is thus greatly curtailed. All they can do is to lessen the cost of production by all means possible, to pick the very best men they can get, and in other ways to balance increased wages by decreased working expenses or larger output. But this process cannot go on forever, and the mine-owner must reach the limit sooner than other employers, when he must abandon work and throw his men out of employment. This process has already begun its harmful work even in this young State, where many mines have been compelled to close down because they cannot afford to pay the high wages ordered by the Court.

The failure of compulsory arbitration here and elsewhere may not be unproductive of good if its lessons be read aright. The principle of arbitration for the settlement of disputes, whether they be international or industrial or social, is an excellent one; in fact, it is the only one short of an appeal to force. But to be effective it must be voluntary. That truth was clearly recognized by the delegates to the first Peace Conference held at the Hague five years ago; it is recognized in the English Conciliation Act of 1896; in the constitution of the Conciliation Court established in France; and in the methods of the State Board of Conciliation in South Australia.

The difference between voluntary and compulsory arbitration is just this, that the former requires both parties to a dispute to ask for arbitration and set the necessary

machinery in motion, while the latter necessitates action on the part of only one party to the dispute to bring a case before the Court. Thus, in the case of compulsory arbitration, the principle of compromise, which is essential to any effective agreement, is practically eliminated altogether. The attitude of the two parties before a Compulsory Arbitration Court is aggression on the one side and resentment on the other. Whatever the award may be, it is certain not to satisfy both parties, and the one which considers itself aggrieved will either repudiate the award altogether or resort to other devices to counteract the effects of it.

Of voluntary arbitration, on the other hand, the very essence is compromise and fair dealing. If a dispute arise between two parties, and if they fail to come to a satisfactory agreement after talking matters over, they decide to submit it to arbitration. Both parties are pledged beforehand to accept the award, whatever it may be; and both are ready to pledge themselves to that effect because they know that it will be just and equitable and will be given with a full knowledge of all the circumstances of the case. Thus in England, about a couple of years ago, a disastrous strike in the Lancashire industry was averted by voluntary arbitration, both sides readily submitting to the award given. Had a Compulsory Arbitration Act been in existence the employers in both cases would probably have been forced into Court, and after a long and expensive inquiry an award would have been given with which one side or the other would have been bitterly dissatisfied.

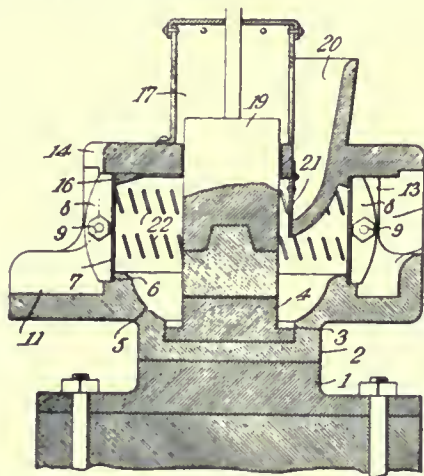
The whole tendency of voluntary arbitration is toward industrial peace. Under it there is no opportunity, such as a Compulsory Arbitration Act affords, of making a mountain of agitation out of a molehill of pretext, and bringing to arbitration some frivolous dispute that could easily be settled by five minutes' friendly conversation between employer and employee. The whole tendency of compulsory arbitration, especially when the compulsion is practically all on one side, is to generate industrial irritation, friction, and strife. Voluntary arbitration teaches employers and employees to regard themselves as friends and allies, bound together by ties of common interests, and prepared to sink or adjust minor differences in order that they may the better work together for their mutual benefit. Compulsory arbitration forces employers and employees into mutual bitterness and hostility; it compels them to look upon each other as enemies, not as allies; it makes the main object of each to exact from the other the uttermost farthing that the law allows, while the interests of the industry upon which they both depend are neglected and impaired, to the ultimate and inevitable detriment of both.

Without going into the details of its practical application, we are convinced that in the principle of voluntary arbitration, in providing the machinery for compromise and arbitration to which both parties may voluntarily resort, will be found the only effective means of satisfactorily settling industrial disputes and of preventing, so far as they can possibly be prevented, such mischievous methods as strikes and lock-outs. To quote one prominent labor leader in America: "Arbitration, to be practical, to be beneficial, must be entirely voluntary. Compulsion and arbitration are in themselves contradictory terms; there can be no real arbitration that is compulsory." And another writes: "The growing movement is toward organization among employers and workmen, which affords the perfect machinery for facilitating settlements in disputes. In this voluntary arbitration in which representatives of capital and labor are their own arbitrators, I believe lies the perfect harmony and the completion of economy in the industrial world."

MINING AND METALLURGICAL PATENTS.

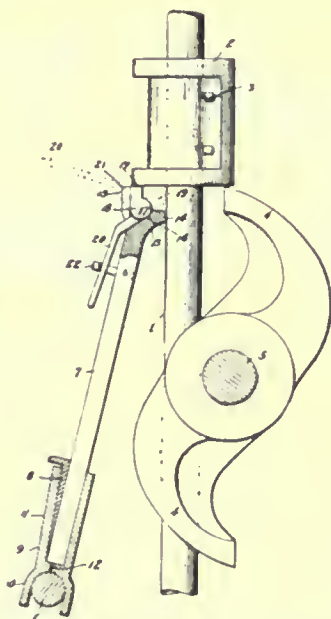
Specially Reported for the MINING AND SCIENTIFIC PRESS.

ORE STAMP-MILL.—No. 859,044; James E. Brooks, Crawfordsville, Ore., assignor of one-half to James C. Munckers, Crawfordsville, Oregon.



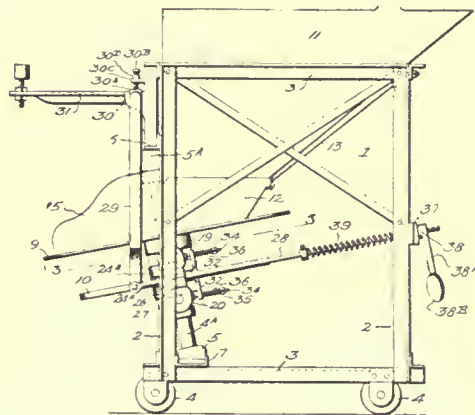
A stamp-mill comprising a base, a body mounted thereon and having a die recess surrounded by an annular rim, a screen surrounding the rim, a lip extending from the body, an annular trough surrounding the screen and opening on to the lip, said trough having upwardly extending oppositely disposed walls, a cover bearing upon said walls and having an annular flange projecting into the screen, said cover having a central opening, a stamp guided within said opening and disposed above the die, a dome extending upward from the cover and over the stamp and opening, a feed spout extending along one side of the dome and through the cover, said spout being disposed to feed material into the screen and toward the stamp, and a gravity actuated door suspended across the discharge end of the spout.

STAMP-MILL.—No. 860,307; Pierre N. Leveque, Lead, South Dakota.



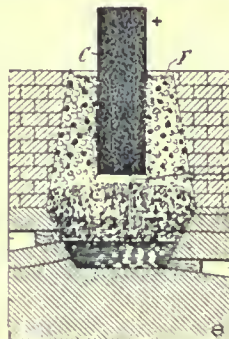
A device of the character described comprising a bar having its lower end engaged with a fixed pivot in a stamp-mill to permit its upper end to be swung into and out of the path of a tappet, said bar having at its upper end a horizontally extending portion to engage the stem of a stamp, a vertically extending stop portion, and a bearing, a bell crank fulcrum in said bearing, and having an arm to swing between the horizontal and vertical portions of the bar, and to engage the bottom of a tappet to raise and lower the same.

ORE-FEEDER.—No. 853,346; Henry Eggers, Denver, Colorado.



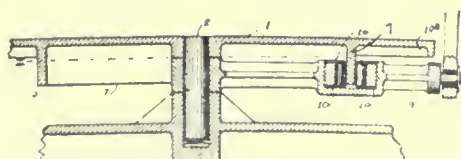
In an ore feeder, the combination of the frame, provided with floor rollers and an inclined vertical shaft at one end, with an ore feeding disk secured to said shaft, an ore hopper in said frame, having its discharge aperture resting close onto said disk and arranged to discharge thereon, ore guards arranged to guard the ore from said discharge aperture to the discharge edge of said ore feeding disk, a frictional disk secured to said shaft, a pair of roller supporting arms pivotally mounted on said shaft on opposite sides of said disk, a wedge between each roller and said frictional disk, and arranged to have a slight reciprocal movement of said rollers, resilient means for normally holding said rollers in engagement with said wedges, a reciprocating rod spring controlled in one direction of its movement, connected to said roller supporting arms, and means for moving said rod in the opposite direction of its reciprocal movement.

ELECTRIC SMELTING.—No. 861,280; Paul L. T. Héroult, La Praz, France, assignor to Societe Electro-Metallurgique Francaise, Froges, France.



In the smelting of iron ore in an electric furnace having an electrode from which the current passes to the base of the furnace, the process which consists in feeding a charge of ore and carbon in such proportion that the carbon forms a magma below the electrode, and the ore is fused above the column and is reduced in passing therethrough, and the molten iron collects at the bottom, and adding lime to the charge in quantities sufficient to form a scale of desired thickness at the sides of such column, thereby diminishing the cross-section of the column.

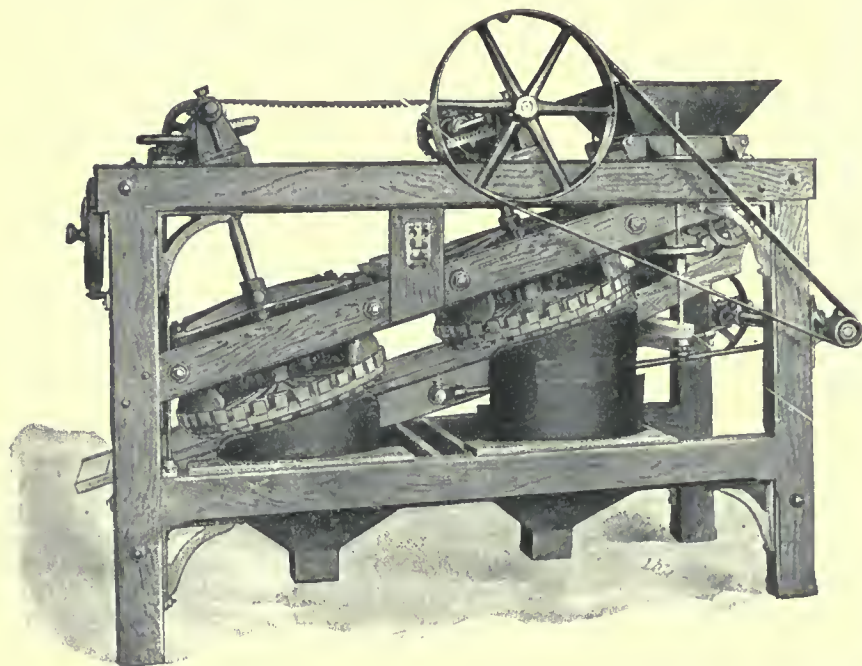
ORE-FEEDER.—No. 863,229; Grant B. Shipley, Milwaukee, Wis., assignor to Allis-Chalmers Company, Milwaukee, Wis., a Corporation of New Jersey.



The combination with a chute, of an inclined rotatable table therebelow, said table being provided adjacent its periphery with a drip bead, and means for supporting said table

A Magnetic Separator.

Owing to the greater cheapness of electricity, the employment of magnetic separation in ore dressing has been widened. Among the machines in successful use is the Dings Magnetic Separator, illustrated in the accompanying drawing. It is described as a machine of medium intensity, and has been used successfully in the treatment of lead ore by the Frisco Mining Co. at Gem, Idaho, where



five of these machines are now at work. Similar machines are in use by Henry E. Wood & Co., of Denver, A. R. Wilfley at Patagonia, Ariz., the Kootenay Ore Co. at Kaslo, B. C., the Colorado Zinc Co., Denver, the General Engineering Co., Salt Lake, and Claudet & Wynn, Rossland, B. C. In the illustration a double magnet is shown, but machines with a single magnet are also made. It is stated that it is possible to make five separations in one operation. The ore is fed from the hopper upon a vibrating conveyor over which it passes in a thin layer through four zones of separation. These are covered by rims of rotating wheels carrying secondary magnets, which attract and remove the magnetic material, discharging it over the sides of the conveyor. The secondary magnets are saturated by pole pieces of powerful primary magnets, while over the conveyor, but are automatically demagnetized as they pass out of the magnetic circuit to the neutral position where the rims of the wheels overhang the conveyor. The non-magnetic heads pass for final delivery at the lower end of the conveyor. Every part of the machine is accessible for inspection. The machine is made by the Dings Electro-Magnetic Separator Co. at Milwaukee, Wis.

Books Received.

'The Copper Mines of the World' by Walter Harvey Weed. Hill Publishing Co. 370 pages. Illustrated. Price \$4. This is a book the publication of which has been awaited with keen interest by the many interested in the exploitation of copper deposits. Mr. Weed has won so distinct a place as an authority on the geology of copper lodes that it is not necessary to emphasize his fitness for the task of preparing a book. The headings of the chapters suggest the wealth of information distributed among the pages of this volume: Distribution of Copper Deposits, Production of Copper, Mineralogy, Geologic Occurrence, Outcrops, Genesis of Copper Deposits, Classification. The second part of the book, from Chapter VIII to XXII, inclusive, is devoted to descriptions of the principal copper mines of the

world. Among many excellent features are the little outline maps of the chief copper regions and the accurate geologic sections. We congratulate the author and publisher on bringing out a book so useful and timely. For sale by the MINING AND SCIENTIFIC PRESS.

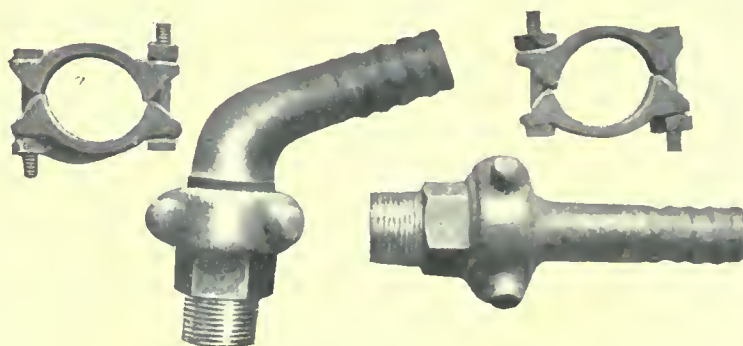
'Shaft-Sinking Under Difficult Conditions,' by J. Riemer. Translated from the German by C. R. Corning and Robert Peele. 176 pages, 19 folding plates, and 18 figures. Price, \$3. Published by John Wiley & Sons. This is a scholarly bit of work, and will appeal to mining engineers, especially to those that have had charge of, or desire to be prepared for, work in shifting strata and water-soaked ground. In the iron and copper regions of Michigan, in the coalfields of Pennsylvania, and in the sulphur and salt deposits of Louisiana, there is opportunity for using the experience recorded in this book. But to any mining engineer, the information given and the work described will be of great value. For sale by the MINING AND SCIENTIFIC PRESS.

Compressed Air Hose Connections.

Among recent improvements for handling air or steam in drilling are the new Reardon patent couplings for compressed-air and steam hose, manufactured by the Compressed Air Machinery Co. of San Francisco. The couplings, illustrated herewith, have

been designed to take the natural fall of the hose at its point of connection to the drill or machinery in the event of the hose being suspended in a shaft or coming up to the machine from the floor of the drift.

In ordinary hose, oil soon collects inside the tube at a point immediately adjoining the coupling and weakens the tube by destroying the fabric. The weight of the hose then causes a kink at this point, thus reducing the efficiency of



service. To prevent just such trouble these couplings were designed.

Catalogues Received.

THE DENVER FIRE CLAY CO. is distributing its latest illustrated catalogue of assayers' and chemists' supplies. This is a comprehensive catalogue and price list of 350 pages, and includes quotations on a great variety of chemical, physical, and general laboratory supplies.

THE ALLIS-CHALMERS CO. has issued Revised Bulletin No. 1,412, on the subject of crushing rolls. This contains complete tables and lists of parts, and should be useful in ordering repairs.

THE use of a 'slogan' in trade advertising is unique, although often used by organizations, and by some newspapers for a headline. Its usefulness is peculiarly suitable when properly placed as a headline, or in the body of advertisements in trade literature.

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TABLE OF CONTENTS

Editorial:	Page.
Notes.....	315
Natural Resources and Railroads.....	316
Greenwater.....	316
By the Way.....	317
General Mining News.....	319
Special Correspondence.....	324
Butte, Montana.....	Cripple Creek, Colorado
Joplin, Missouri.....	Vancouver, British Columbia
Toronto, Canada.....	Salt Lake, Utah
Denver, Colorado.....	
Concentrates.....	330
Discussion:	
The Royal School of Mines.....	Walter McDermott 331
On Technical Writing.....	W. J. Loring 331
Weathered Pyrite.....	William Forstner 332
Conveying Tailing in Launder.....	G. A. Overstrom 332
Articles:	
The Hydraulic Equipment of the Old Channel Mines.....	John M. Nicol 333
Uses of Antimony.....	336
A Concrete Tank to Store Tailing.....	337
Manufactured Graphite.....	338
Quick Repairs to a Smoke-Flue.....	338
Keeping Account of Supplies—II.....	
Economy in Mining Operations.....	Matt. W. Alderson 340
The Fairmont Hotel.....	Thomas E. Lambert 341
Manjak.....	345
Mining and Metallurgical Patents.....	346
Decisions Relating to Mining.....	344
The Prospector.....	344
Departments:	
Personal.....	318
Market Reports.....	318
Dividends.....	318

Editorial.

MINING OPERATIONS, which were interrupted by a strike, have been resumed at Angels Camp. The union miners voted to return to work, and it is significant that "only Austrians and other foreigners voted to continue the strike." The worst forms of labor tyranny are un-American and we owe them to laborers lately released from the serfdom of the less progressive portions of Europe.

THE EXPERIMENT in the electrical smelting of iron ore in Shasta county, California, is reported to be a success. A tramway from the mine to the smelter is being built, and a plant for the manufacture of electrodes is under construction. Until the branch railroad and the tramway to the mine are completed, the smelter will be used for making ferro-silicon, which brings a higher price than pig iron. This enterprise means much to the industrial development of the Pacific Coast, and we hope to chronicle further progress soon.

OUR CONTEMPORARY in New York, in referring to the copper statistics for 1906 as published by the Geological Survey, says, in an off-hand way, that "the Survey's figure is too low and doubtless will be corrected in its final statement." This might pass in the days when R. P. Rothwell and David T. Day were bitterly opposed, both personally and in statistical exercises, but it will not do at this date, when the work of compiling the figures of metal production is entrusted to a group of capable men, intimately acquainted with the conditions under which the metals are extracted in the various mining districts. As between Mr. L. C. Graton, of the Survey, and the necessarily anonymous compiler on the staff of *The Engineering and Mining Journal*, there is every reason to prefer the former, simply because the Government has better facilities for obtaining data than any trade paper, and the obtaining of them is now in the hands of men thoroughly competent, as was not always the case heretofore.

ON ANOTHER PAGE we publish a useful article, by Mr. John M. Nicol, on the method of saving gold in the course of hydraulic mining in Oregon. Some references are made to Dr. David T. Day's experiments and a fair criticism is offered. At least it is constructive and not merely destructive. We regret that the State Mining Bureau should have published a pamphlet on the same subject recently, consisting of a reprint of matter at least ten years old and so incomplete as to have no practical value, on the top of some uncomplimentary references to the work done by Dr. Day and Mr. Robert H. Richards. Having regard to the fact that the deposits called 'black sands' are found mainly on the Pacific

Coast, it would seem proper for the Mining Bureau to undertake an adequate treatment of the subject.

Natural Resources and Railroads.

ON ANOTHER page we publish a letter from British Columbia referring to the shortage of coke at the smelters of the Boundary district and the steps taken by local authorities to discipline the coal company that is at fault. The Crow's Nest Pass Coal Company is held accountable for a condition of affairs highly detrimental to the mining industry of British Columbia. Whether its charter has been infringed and whether the Government can control the marketing of its output, remains to be seen. It is an interesting situation and is due to the monopoly of a natural resource, with many features comparable to the anthracite monopoly in Pennsylvania.

This shortage of coke is no new thing. For many years past, the smelting industry of the Boundary region has been handicapped by an uncertain supply of the necessary fuel, and ineffectual efforts have been made by the Government of Canada and the officials of the Canadian Pacific Railway to surmount the difficulty, but every effort has failed to effect a permanent improvement, simply because Mr. J. J. Hill controls the Crow's Nest Pass mines, and, in fact, the coal industry of the adjacent region. Moreover, as he controls the railroad that takes the coke from the Crow's Nest to Montana, it has been more profitable for him to send the coke to Montana than to the smelters of the Boundary, because in the one case he gets the profit on the coke, and in the other case, he gets the profit on both the coke and the freight. Officially, he is stated to own only 35% of the stock of the Crow's Nest Coal Co., but as a matter of fact, this interest, together with that of those allied with him, has enabled Mr. Hill to do pretty much as he pleases. Incidentally, it may be mentioned that while there are deposits of coking coal other than those now being exploited, these are not available for the Canadian Pacific Railway or the Government of Canada, because Mr. Hill owns blocks of land commanding access to them. In short, Mr. Hill has got the coking coal of the Northwest under his thumb.

Another interesting episode throwing light upon the monopoly of natural resources and the interference with economic laws, is presented by the experience of the Alaska-Treadwell Mining Co. As is generally known, this mining company and its two neighbors on Douglas island have depended for their fuel-supply on the coal of Nanaimo, on Vancouver island. Last year there was a strike, and the big Alaska-Treadwell stamp-mills were shut down for several months. To prevent a repetition of this experience, the manager has arranged to use oil; and it is a fact that this oil, which comes all the way from southern California is so much cheaper as a fuel than the coal from the comparatively neighboring island of Vancouver, that a saving of \$100,000 per annum will be effected by using oil. The Vancouver coal used to cost from \$4.75 to \$5, delivered, and from these figures it can be judged how cheaply oil can be brought from Lower

California to Douglas island. Incidentally, it may be mentioned that the oil steamers pull the barges laden with concentrate from the Alaska-Treadwell, Mexican United, and Alaska-Mexican mills, consigned to the smelter at Tacoma. This back freight helps to diminish the cost of carrying the oil. Such incidents go to prove that if you want to study economics, do not go to the library, but seek an interview with the representative of the particular railroad company that controls the politics, the resources, and the business of your habitat.

Greenwater.

IN THE EARLY PART of this year we referred to the copper mines of the Greenwater district, and ventured to emphasize the fact that the condition of their development and the proof of their value were wholly insufficient to warrant the tremendous amount of mine promotion and stock speculation then in progress. It is not popular to depreciate mining activity of any kind, and it is rendered unpleasant by the comment of papers committed to the encouragement of stock gambling. At the time of our former criticism, a paper at Los Angeles called *The Mining Review*, undertook to lecture us on the supposed unfair treatment of a promising young mining district. It is not with any particular satisfaction that we can state that the logic of events has confirmed our comment on Greenwater. Incidentally, our informant, Mr. James W. Abbott, is wholly justified; the incident is now to his professional credit. During the past 10 months, the work of exploration has been pushed vigorously; many shafts have been sunk, and at least a score of them have reached a depth varying from a hundred to 600 feet. From the bottoms of the deepest openings, cross-cuts and drifts have tested the indications of ore. Despite this energetic exploration, the results have been distinctly disappointing. A glance at the dumps throughout the district will show that no large bodies of pay-ore have been met, and the present condition of the prospects that were expected to become mines, is depressing. Most of the smaller companies have ceased work entirely, and the larger companies are employing only a few men. At the present time there are hardly 20 men doing work underground in the entire district, as against no less than a hundred a few months ago. Two or three carloads of ore have been shipped, but there is no longer any pretense that large orebodies have been found. Almost without exception, the lower levels from the prospect shafts have cut no ore at all, or material even less promising than that seen at the surface. In consequence, the shares of the various companies are quoted at about one-tenth the price of six or eight months ago. The camp is losing its population, and is likely to become almost deserted in a few weeks. The larger companies controlled by Patsy Clark and Schwab are said to be looking for mining claims in other localities, with a view to giving their stockholders another speculative opportunity, and incidentally of adjusting matters so as to avoid the expostulation of those that have suffered by putting their money into these unfortunate schemes.

By the Way.

In a recent address before the British Association for the Advancement of Science, Mr. Silvanus P. Thompson said:

We must not delude ourselves with imagining that the happiness and welfare of mankind depend only on its material advancement, or that moral, intellectual, and spiritual forces are not in the ultimate resort of greater moment. But if the inquiry be propounded, what it is that has made possible this amazing material progress, there is but one answer that can be given—science. Chemistry, physics, mechanics, mathematics, it is these that have given to man the possibility of organizing this tremendous development. And the great profession which has been most potent in applying these branches of science to wield the energies of Nature and direct them to the service of man has been that of the engineer. Without the engineer, how little of all this activity could there have been? And without mathematics, mechanics, physics, and chemistry, where was the engineer?

If in looking over this England of Edward the Seventh we try to put ourselves back into the England of Edward the Sixth, we must admit that the difference to be found in the social and industrial conditions around us are due not in any appreciable degree to any changes in politics, philosophy, religion, or law, but to science and its applications. If we look abroad, and contrast the Germany of Wilhelm the Second with the Germany of Charles the Fifth, we shall come to the like conclusion. So also in every one of the progressive nations. And it is precisely in the stagnant nations, such as Spain or Servia, where the cultivation of science has scarcely begun, that the social conditions remain in the backward state of the Middle Ages.

In engineering, above all other branches of human effort, we are able to trace the close interaction between abstract science and its practical applications. Often as the connection between pure science and its applications has been emphasized in addresses upon engineering, the emphasis has almost always been laid upon the influence of the abstract upon the concrete. We are all familiar with the doctrine that the progress of science ought to be an end in itself; that scientific research ought to be pursued without regard to its immediate applications; that the importance of a discovery must not be measured by its apparent utility at the moment. We are assured that research in pure science is bound to work itself out in due time into technical appliances of utility, and that the pioneer ought not to pause in his quest to work out potential industrial developments. We are invited to consider the example of the immortal Faraday, who deliberately abstained from busying himself with marketable inventions arising out of his discoveries, excusing himself on the ground that he had no time to spare for money-making. It is equally true, and equally to the point, that Faraday, when he had established a new fact or a new physical relation, ceased from busying himself with it, and pronounced that it was now ready to be handed over to the mathematicians. But, admitting all these commonplaces as to the value of abstract science in itself and for its own sake, admitting also the proposition that sooner or later the practical applications are bound to follow upon the discovery, it yet remains true that in this thing the temperament of the discoverer counts for something. There are scientific investigators who can not pursue their work if troubled by the question of ulterior applications; there are others, no less truly scientific, who simply can not work without the definiteness of aim that is given by a practical problem.

There is, however, another aspect of the relation between pure and applied science, the significance of which has not been hitherto so much emphasized, but yet is none the less real—the reaction upon science and upon scientific discovery of the industrial applications. For while pure science breeds useful inventions, it is none the less true that the industrial development of useful inventions fosters the progress of pure science. No one who is conversant with the history, for example, of optics can doubt that the invention of the telescope and the desire to perfect it were the principal factors in the outburst of optical science which we associate with the names of Newton, Huygens, and Euler. The practical application, which we know was in the minds of each of these men, must surely have been the impelling motive that caused them to concentrate on abstract optics their great and exceptional powers of thought. It was in the quest—the hopeless quest—of the philosopher's stone and the elixir of life that the foundations of the science of chemistry were laid. The invention of the art of photography has given immense assistance to sciences as widely apart as meteorology, ethnology, astronomy, zoology, and spectroscopy. Of the laws of heat, men were profoundly ignorant until the invention of the steam engine compelled scientific investigation and the new science of thermodynamics was born.

The history of electric telegraphy furnishes a very striking example of this reflex influence of industrial applications. The discovery of the electric current by Volta, and the investigation of its properties, appear to have been stimulated by the medical properties attributed, in the preceding 50 years, to electric discharges. But, once the current had been discovered, a new incentive arose in the dim possibility it suggested of transmitting signals to a distance. This was certainly a possibility, even when only the chemical effects of the current had yet been found out. Not, however, until the magnetic effects of the current had been discovered and investigated did telegraphy assume commercial shape. But no sooner had the telegraph become of industrial importance, with telegraph lines erected on land and submarine cables laid in the sea, than fresh investigations were found necessary; new and delicate instruments must be devised; means of accurate measurement heretofore undreamt of must be found; standards for the comparison of electrical quantities must be created; and the laws governing the operations of electrical systems and apparatus must be investigated and formulated in appropriate mathematical expressions. And so, perforce, as the inevitable consequence of the growth of the telegraph industry, and mainly at the hands of those interested in submarine telegraphy, there came about the system of electrical and electromagnetic units.

In considering this reflex influence of the industrial applications upon the progress of pure science, it is of some significance to note that for the most part this influence is entirely helpful. There may be sporadic cases where industrial conditions tend temporarily to check progress by imposing persistence of a particular type of machine or appliance; but the general trend is always to help to new developments. The reaction aids the action; the law that is true enough in inorganic conservative systems, that reaction opposes the action, ceases here to be applicable, as indeed it ceases to be applicable in a vast number of organic phenomena. It is the very instability thereby introduced which is the essential of progress. The growing organism acts on its environment, and the change in the environment reacts on the organism—not in such a way as to oppose the growth, but so as to promote it. So is it with the development of pure science and its practical applications.

Personal.

S. F. EMMONS is at Denver.

E. W. BYRDE is in the French Sudan.

F. W. BRADLEY is at Elk City, Idaho.

ARTHUR S. DWIGHT is in the Southwest.

ERNEST CRAIG is at Cooney in New Mexico.

STEWART RAWLINGS is here from Durango, Mexico.

J. R. BLAKE, of New York, is on a visit to California.

COURTENAY DE KALB spent a few days in San Francisco.

GEORGE L. HOLMES has been examining dredging ground in Colorado.

E. A. H. TAYS has opened an office in the Jacobson Bdg., at Denver.

AUGUSTUS J. BOWIE is in San Francisco, on his return from Japan.

FRANK H. TEATS has opened an office in the Jackson Bdg., Denver.

WILLIAM CAMPBELL, of Columbia University, was here for a few days.

FRANK C. LORING has opened an office at 20 Adelaide St., East Toronto.

H. FOSTER BAIN, State Geologist of Illinois, was in San Francisco recently.

A. M. CAMPBELL has opened an assay-office at 1417 Lawrence St., at Denver.

T. F. JAMES is manager for the Belen Mining Co., at Cumpas, in Sonora, Mexico.

S. F. PARISH has moved from Tonopah to 406 Citizens' National Bank Bdg., Los Angeles.

GEORGE OTIS SMITH, the Director of the U. S. Geological Survey, was in San Francisco this week.

GEORGE W. MYERS, of the Chrome Steel Co., has returned to his old office at 724 Kohl Bdg., San Francisco.

ARTHUR E. PETTIT has arrived in Wyoming from London, to examine the Penn-Wyoming copper mines.

FRANK R. HALL has resigned as engineer to the New York & Honduras Rosario Mining Co., and is returning home.

GEORGE D. LOUDERBACK has returned to the University of California, on the completion of geological work near Santa Barbara.

ARTHUR C. NAHL, manager for the Progreso Mining Co., at Triunfo, Lower California, Mexico, is on a visit to his home at Berkeley.

C. S. NEWCOMB has been appointed superintendent of the cyanide plant of the Dolores Mines Ltd. in Chihuahua, succeeding ROBERT CLARKE, who resigned.

EDWARD A. NIS has resigned as mine superintendent of the New York & Honduras Rosario Mining Co., to be general superintendent for the same company.

A. H. BUCK, after nine years in Mexico and Central America, is now a resident of Joplin, Missouri. Mr. Buck is associated with M. S. Parker in the firm of Parker & Buck, their office being at 309 Bartlett Bdg., Joplin.

L. VOGELSTEIN & Co., New York, give the following figures of German consumption of foreign copper for the months January to July, 1907:

Imports of copper	73,732 tons
Exports " "	4,969 "
Consumption "	68,763 "

As against consumption during the same period in 1906 of 68,659 tons. Of this quantity 57,532 tons were imported from the United States.

Dividends.

On September 4 the Bunker Hill & Sullivan Mining & Concentration Co. paid dividend No. 120 of \$180,000. This makes the amount of dividends paid since January 1, \$1,620,000, and the total to date \$9,486,000.

Latest Market Reports.

LOCAL METAL PRICES—Sept. 12.

Antimony.....	17@20c	Quicksilver (flask).....	\$38@39
Copper.....	20@22c	Spelter.....	7@ 7.75c
Pig Lead.....	4.85@ 5.80c	Tin.....	42.50@44c

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.

Date	Electrolytic Copper	Lead	Spelter	Silver
Aug. 29.....	17 $\frac{3}{4}$	5 $\frac{1}{4}$	5.53	67 $\frac{7}{8}$
" 30.....	17 $\frac{3}{8}$	5 $\frac{1}{4}$	5.53	68 $\frac{1}{2}$
" 31.....	17 $\frac{3}{8}$	5 $\frac{1}{4}$	5.53	68 $\frac{1}{2}$
Sept. 1.....	Sunday. No market.			
" 2.....	Holiday. No market.			
" 3.....	17 $\frac{1}{2}$	5 $\frac{1}{4}$	5.48	68 $\frac{3}{4}$
" 4.....	17 $\frac{3}{8}$	5 $\frac{1}{4}$	5.48	68 $\frac{3}{4}$
" 5.....	17 $\frac{3}{8}$	4 $\frac{3}{4}$	5.48	68 $\frac{3}{4}$
" 6.....	17	4 $\frac{3}{4}$	5.26	68 $\frac{1}{2}$
" 7.....	16 $\frac{3}{4}$	4 $\frac{3}{4}$	5.26	68 $\frac{1}{2}$
" 8.....	Sunday. No market.			
" 9.....	16 $\frac{1}{2}$	4 $\frac{3}{4}$	5.26	68 $\frac{3}{4}$
" 10.....	16 $\frac{1}{4}$	4 $\frac{3}{4}$	5.26	68 $\frac{1}{4}$
" 11.....	16 $\frac{1}{4}$	4 $\frac{3}{4}$	5.26	67 $\frac{3}{4}$

MINING STOCK QUOTATIONS—NEW YORK.

Closing Prices.

	Sept. 5.	Sept. 11.
Bingham Central.....	1	7 $\frac{1}{8}$
Boston Copper.....	22	17
Cumberland Ely.....	7 $\frac{1}{4}$	6 $\frac{5}{8}$
Dolores.....	5 $\frac{1}{2}$	5
El Rayo.....	3 $\frac{3}{4}$	3 $\frac{1}{4}$
Guanajuato Con.....		3 $\frac{1}{4}$
Gloroux Con.....	6 $\frac{3}{4}$	5 $\frac{1}{2}$
Greene Con.....	11 $\frac{3}{4}$	15
Nevada Con.....	10 $\frac{1}{4}$	10 $\frac{1}{4}$
Nipissing.....	8 $\frac{1}{2}$	7 $\frac{1}{8}$
Tennessee Copper.....	35 $\frac{1}{2}$	31
Tonopah Ex.....	2	1 $\frac{1}{2}$
Tonopah-Belmont.....	3	2 $\frac{3}{4}$
Tonopah.....	12	11 $\frac{1}{4}$
United Copper.....	53 $\frac{1}{2}$	53
Utah Copper.....	23 $\frac{3}{4}$	24

(By courtesy of Hayden, Stone & Co., 25 Broad St., New York.)

SOUTHERN NEVADA STOCKS.

San Francisco, Sept. 12.

Atlanta.....	\$ 47	Laguna.....	1.30
Belmont.....	2.90	Little Tonopah.....	1.00
Columbia Mtn.....	47	Manhattan Con.....	35
Combination Fraction.....	2.05	Midway.....	76
Daisy.....	1.37	Mizpah Extension.....	20
Fairview Eagle.....	1.45	Mohawk.....	16.50
Florence.....	4.05	Montana Tonopah.....	2.92
Gold Bar (Bullfrog).....	55	Nevada Hills.....	5.25
Gold Bar (Goldfield).....	50	Red Top.....	3.15
Goldfield Con.....	6.77	Sandstorm.....	45
Goldfield of Nevada.....	1.30	Silver Pick.....	54
Gold Kewanas.....	65	St. Ives.....	84
Great Bend.....	62	Tonopah Extension.....	1.70
Jim Butler.....	82	Tonopah of Nevada.....	11.00
Jumbo.....	3.15	Tramp Con.....	35
Jumbo Extension.....	1.62	West End.....	74

(By courtesy of W. C. Ralston, 368 Bush St.)

COPPER SHARES—BOSTON.

Closing prices.

Name of company.	Sept. 12.	Name of company.	Sept. 12.
Adventure.....	2 $\frac{1}{4}$	Michigan.....	8 $\frac{3}{4}$
Ahmeek.....	70	Mohawk.....	60
Allouez.....	30	Nevada Con.....	93 $\frac{1}{4}$
Amalgamated.....	61 $\frac{1}{4}$	North Butte.....	47
Areadian.....	4 $\frac{1}{4}$	Old Dominion.....	23 $\frac{1}{2}$
Atlantic.....	9 $\frac{1}{2}$	Osceola.....	90
Balakiala.....	5 $\frac{1}{4}$	Parrot.....	13
Bingham Con.....		Phoenix.....	1
Boston Con.....	17 $\frac{3}{8}$	Quincy.....	81
Butte Coalition.....	15 $\frac{1}{4}$	Raven.....	1
Calumet & Arizona.....	108	Rhode Island.....	37 $\frac{1}{2}$
Calumet & Hecla.....	600	Santa Fe.....	2
Centennial.....	19	Shannon.....	10 $\frac{1}{4}$
Con. Mercur.....	40	Superior & Pittsburg.....	9 $\frac{1}{2}$
Copper Range.....	57 $\frac{1}{2}$	Tamarack.....	63
Daly-West.....	13	Trinity.....	14 $\frac{3}{4}$
Franklin.....	8	United Copper com.....	50
Granby.....	59	Utah Copper.....	36
Greene-Canea, etc.....	9 $\frac{1}{4}$	Victoria.....	43 $\frac{1}{4}$
Isle Royale.....	13 $\frac{3}{4}$	Winnona.....	61 $\frac{1}{2}$
Mass.....	33 $\frac{1}{4}$	Wolverine.....	112

(By courtesy of E. F. Hutton & Co., 490 California St.)

General Mining News.

ALASKA.
KETCHIKAN.

Some good ore has been found near the mouth of the Chickamin river by J. E. Kydig and E. K. Turner. The last ship down carried 500 tons of Rush & Brown ore and 2,500 tons from the Jumbo, consigned to the Tye smelter at Ladysmith.—Twenty-five men are employed at the Rush & Brown mine, and a larger force could be worked to advantage if proper transportation facilities were available for handling the ore. As it is, the bunkers are full and the mine could produce 100 tons per day.—P. L. Peterson and other owners of the Eagle copper claims at Boca de Quadra, have bonded the property to E. M. Aldrich of Spokane, who will explore it thoroughly.—The Goodro & Thomas tunnel is 1n 60 ft.—A vein carrying chalcopryrite is being developed by Daniel Nelson on the Snowbird claim, near Kasaan village.

ARIZONA.
COCHISE COUNTY.

If the metal market does not improve, it is thought that some of the big companies operating in the Warren district will reduce their working forces and devote more attention to development. The Copper Queen will probably pursue this policy within 60 days if the price of copper does not go up.—The Wolverine & Arizona drift from the Higgins shaft has struck ore and the management is optimistic regarding the property.—At the Copper Queen smelter, only six furnaces are running, with four converters handling the matte. The equipment includes 10 furnaces, but only nine have been run at one time. The closing down of all but six is to enable the repair gang to overhaul the furnaces, and the lower price of copper probably has something to do with this curtailment of production. About 150 men were laid off, mostly Mexicans.—Four furnaces are working at the Calumet & Arizona smelter.

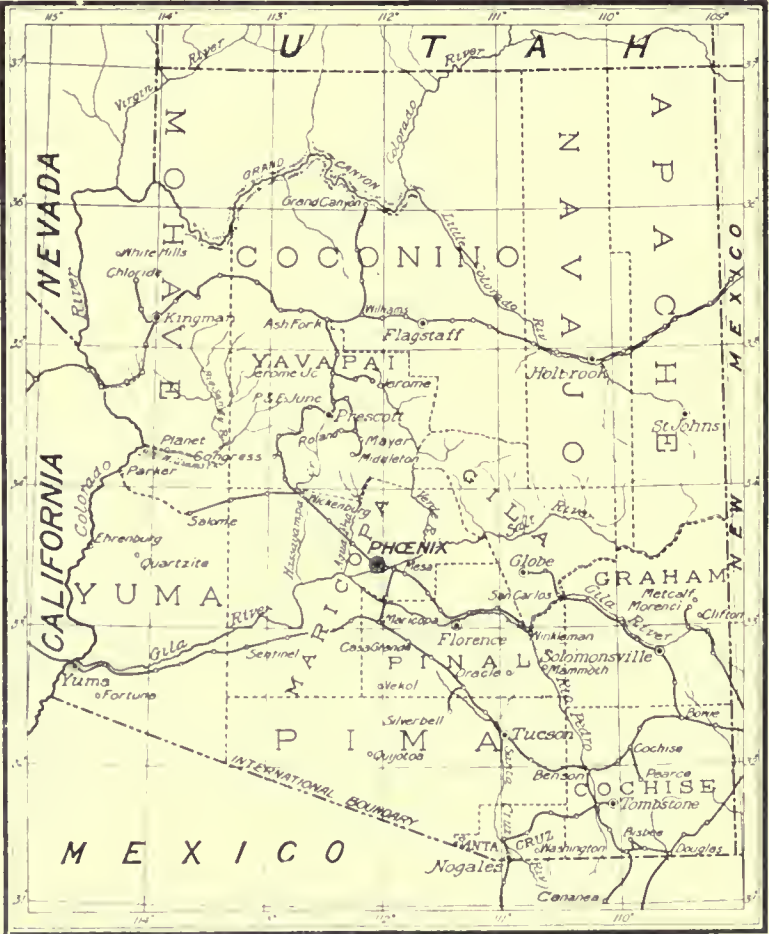
At Johnson, it is understood that the Arizona Consolidated M. Co. will erect a new head-frame and hoist on the Mammoth property, west of the Copper Chief. This property was leased and worked for some time by Bob Mackay, and some good ore was produced.—A new 40-hp. hoist has arrived for the Empire. The main shaft is down about 250 ft. and two shifts are sinking. At the 225-ft. level, a cross-cut has been driven 150 ft.—The Cochise Mining Co.'s shaft is down 600 ft., still in blue limestone.—Ore is being mined and stocked at the Magazine mine, of which H. J. Clifford is manager.

GILA COUNTY.

The Saddle Mountain M. Co., operating at Christmas, in the southwestern part of this county, has ceased work temporarily, pending the arrival of coke for the smelter, and the repair of portions of the plant. About seven carloads of matte have been shipped each month. Burnett Goodwin is the assistant manager.—The washouts along the line of the Gila Valley, Globe & Northern have been the worst ever experienced. All rail communication has been cut off and the wires have been down, but fortunately the Globe smelter had enough fuel on hand to enable it to run without interruption.—The Old Dominion produced more copper last month than ever before in its history, the smelter output being about 3,500,000 lb. Underground, development is progressing without interruption. The cross-cut in block No. 6 on the 14th level is being driven through. The width of No. 1 sulphide vein as here exposed is only seven feet, but the ore runs high in sulphur and iron. No. 2 vein will be encountered soon. A good deal of water

is coming in. The winze from the 14th level is 150 ft. deep.

The Gem shaft of the Globe Consolidated is 920 ft. deep and still in diorite. In the Globe-Boston shaft a station is being cut at the 782-ft. level, and a 500-gal. Prescott pump will be installed, as water was encountered in the bottom of the shaft, at 789 ft.—From the Globe-Boston shaft, two cross-cuts will be driven, one to the northwest, by which the vein that was worked on the 450-ft. level is expected to be cut, and another to the southwest, which will be the first cross-cut to go under Big Johnny gulch, and will penetrate Buffalo hill and connect with the Buffalo cross-cut of the Gray mine of the Old Dominion, at the 740-ft. level, making a cross-cut 2,200 ft. long.—Shipments of ore from the Gibson to the Old Dominion smelter have fallen off a little, and will probably total about 1,200 tons for the past month. A large force, 240 men, is employed. The new



Map of Arizona.

three-compartment shaft is down 150 ft., and the head-frame is completed.—The lower workings on the Arizona National property have been temporarily abandoned while cross-cuts are being driven in opposite directions from the shaft at a depth of 125 ft., to determine what has become of the remainder of the vein. The formation is rather puzzling as it seems that the vein splits and dips both ways from the shaft. About 50 ft. of cross-cutting has been done so far and there is no country rock in sight. The ore appears to be getting richer in the west cross-cut, according to recent reports from the mine. At the bottom of the shaft, which is 290 ft. deep, the country rock appears to be dipping in opposite directions from the shaft. Two shifts are working at the mine.—The Oro Grande M. Co., owned by Globe men, has been developing a group of copper claims on Upper Mineral creek in this county, adjacent to the Parish property. They have a shaft down 110 ft., and are driving both ways on a vein five feet wide.

GRAHAM COUNTY.

The Shannon Copper Co. ends its fiscal year with the last day of August. It is expected that the net earnings for the year will be about \$800,000, after all charges, including the

retirement of \$100,000 bonds. This would be about \$2.66 per share upon the outstanding 300,000 shares. The average price for copper obtained during the past 12 months was about 22c., the highest being a trifle over 25c. Over a similar period a year ago, the net earnings were only \$333,000.

MOHAVE COUNTY.

A gasoline hoist has been shipped to the Redemption-Clyde mines at Chloride. It is reported that R. J. Ferguson has succeeded in financing these mines, and work will be pushed.—Several of the directors of the Benedictine company have been in Kingman, from Los Angeles, to settle the claims against the company, amounting to about \$10,000. W. P. Carr will be in charge of the work at Cedar.—J. L. Whitney and a force of men are sampling the McCracken mines at Signal, to test the ore for amenability to concentration and cyanidation.—A new hoist and pump have been installed at the K. P. mines in I X L basin, and sinking will be resumed. H. M. Bowen is the manager.—E. J. McNulty of Mineral Park is in charge of the Aztec Turquoise M. Co.'s property; a good many gems were shipped during the past year.—The work of remodeling the Cupel mill is nearly completed. Good concentrating ore is being broken in the east drift of the De la Fontaine mine.—A 15-hp. gasoline hoist has been shipped to the Idaho mine at Cerbat. A magnetic separator may be installed to handle the ore at the Vanderbilt mill. John Boyle, Jr., is in charge.—The drift on the vein at the Stockton Hill property has been driven 2,300 ft., and a long and continuous orebody has been exposed.

PIMA COUNTY.

Reports have it that the Heinze interests have secured control of the Helvetia Copper Co. Representatives of these people have recently been inspecting the property. A great deal of money has been expended in the development of this property. There is a narrow-gauge railroad and a 200-ton smelter. Recently a good strike was made in a tunnel between the Copper World and the Isle Royale shafts.

PINAL COUNTY.

The Roy Copper Co. has ceased operations, and 300 men have been thrown out of employment. Various reasons are assigned to this action, among which are the non-completion of the big concentrating plant at Kelvin, seven miles distant, and the attempt of the Western Federation of Miners to unionize the camp. The company employees give out the statement that work at the mine is ahead of work at the mill, and the shut-down is for this reason.

YAVAPAI COUNTY.

(Special Correspondence).—The Haggott Giraud Co., consulting engineers, of Prescott, have been placed in charge of the development of the Jerome-Verde Copper Co.'s property, and active work will be started about September 15. W. P. Dykema, of Michigan, is in charge. A complete hoisting plant was ordered several weeks ago.—T. C. Campbell, mine manager, reports a strike of ore in the new shaft of the Jerome Mines Development Co. at a depth of 27 ft. from the surface. He states that there is a lens of sulphide ore occurring in the schist, and that it was entirely unlooked for, as their diamond-drill had demonstrated ore at this point to lie at a depth of 527 ft. This company expects to put in a complete hoisting plant.—The workings on the 1888 claim, belonging to the Hull Copper Co., have been cleared of water and muck, and carefully retimbered. Driving will be commenced, to connect with the Dillon tunnel.

Jerome, Sept. 4.

(Special Correspondence).—Several companies are operating on Copper creek in the Eureka district. The men comprising the companies are many of them experienced miners. Good machinery has been installed during the past year, and all of the surface improvements are suggestive of permanence. Several hoisting plants are in operation, as well as air-compressors. A new wagon-road is being built from the Copper Creek road to the Mammoth group of mines, where work will be started soon. Miners are coming into the district daily in search of claims, and the country for miles around is dotted with locations. A

little over a year ago operations were started in the district by the Giroux & Hook syndicate, which now holds by right of location a stretch of mineral country six miles long by four miles wide. The syndicate has a large air-compressor in operation, as well as two hoisting plants, and is running five tunnels into the mountain, the lower one of which will reach a depth of between 400 and 500 ft. Following this work, the American Mines & Exploration Co. has bonded the Voge and Hise groups, consisting of over 50 claims, upon which work is being prosecuted. The prospect for the development of a good mine here is equally as encouraging as in the Giroux & Hook holdings. Preliminary surveys for a railroad into the district have been made and thousands of dollars have been spent in constructing wagon-roads into the different camps.

Prescott, Sept. 5.

Two tunnels are being driven on the Houston-Arizona property, one on the Copper King claim and one on the New Departure. W. M. Owens is in charge of the work.—The hoist on the Mexican silver mine is ready to run. Oscar Jennings is the superintendent.—M. D. Gaylord recently examined the McNeill property near Vulture.

CALIFORNIA.

CALAVERAS COUNTY.

The miners' strike in Angels has been declared off, by an affirmative vote of 64, as opposed to 24, and the Coleman proposition of 9 hours per day has been accepted by underground men. The Lightner mine has started work again and the Utica will be unwatered, and the Angels mine will be working in a few days.

NEVADA COUNTY.

A good deal of building material and mining has been arriving in Grass Valley, for the North Star mine; this includes a 500-hp. motor, and three carloads of redwood tank material for the enlarged cyanide plant.—A 25-hp. gasoline hoist has been purchased for the Aurora mine on Randolph flat. The shaft will be sunk to the 300-ft. point, and a pump will be put in at once. H. B. Skewes is the superintendent.—The Prosper mine, on Canada hill, just above the old Canada Hill mine, is being steadily developed by the owners. H. A. Ball, of the Banner mine, has bonded the property. This is an extension of the West Side property that is being opened by a Tonopah syndicate. The lower tunnel is in 150 ft., and a shaft is down 84 ft.—Good progress in development work is being made at the Banner mine, especially in extending the south drift on the 900-ft. level, which is being run toward the old pay-shoot.—A new dynamo, transformers, etc., have arrived at Nevada City for the Alaska mine at Pike City. The power-line from the Rome power-house will soon be completed, and operations at the mine will commence.—A good strike has been made in the Morning Star mine at Badger hill in the old Cherokee district, near Patterson. The ore was found in a new vein that was opened by a cross-cut to the west of the shaft, on the 60-ft. level, and again struck on the 100-ft. level. The main shaft is down 185 ft., and will be continued to the 500-ft. point. Five of the 10 stamps are dropping in the mill. E. E. House is superintendent, and Frank Bigelow, foreman.

PLACER COUNTY.

The Peckham Hill property has recently been examined, with a view to extending the 1,500-ft. tunnel, the face of which is now near the old Blue Gravel shaft.

SHASTA COUNTY.

(Special Correspondence).—The Noble Electric Steel Co. has been recently incorporated to enlarge and operate the smelting works at Heroult. H. H. Noble is president and C. B. Morgan secretary of the company. The work that has been already done at the smelter has demonstrated to the entire satisfaction of those interested that the iron ores in this district can be profitably smelted under the conditions prevailing in Shasta county. Plans are accordingly being rapidly made for the development of this industry on a larger scale. The mine is being actively developed and more property is being secured. Work is proceeding rapidly on a tramroad which is to provide cheap transportation

from the mine to the smelter. This will be about $1\frac{1}{2}$ miles in length. At the smelter preparations are under way for the erection of a plant for the manufacture of electrodes and also for the enlargement of the charcoal plant. In the meantime the present furnace will be used for the manufacture of ferro-silicon. It has been decided to temporarily abandon smelting pig-iron, owing to the high cost of freighting by wagons until the railroad is finished, and because an adequate supply of electrodes cannot be obtained until they are made on the ground. At the present time a new furnace is being designed for the smelting of pig-iron, and this will be installed as soon as the necessary transformers and other machinery can be delivered.—In the Centerville district considerable activity continues and promising developments are progressing. The Monte Cristo group is being developed by A. Monette and associates. This property adjoins the Yankee John mine, which has been undergoing vigorous development. A recent shipment from the latter property assayed \$1,400 per ton. As soon as the new drifts get under the old workings and the known ore-shoots, good results may be expected. With the present development this district should soon produce considerable shipping ore.—From the Little Nellie mine on the Iron Mountain railroad, regular shipments of high-grade ore are being made to the Keswick smelter.—The narrow-gauge railroad constructed by the Mammoth Copper Co. to Quartz hill, to ensure a constant supply of silicious ore is completed, and as soon as the bunkers are finished regular shipments will be commenced.

Redding, Sept. 5.

(Special Correspondence).—A. E. Monette and associates of Nevada have bonded the Jim Long group in the Centerville district. The group contains five claims with small stringers of rich ore. A double-compartment shaft will be sunk and cross-cuts driven to intersect the lode.—The Pittsburg & Mt. Shasta G. M. Co. is shipping ore to Keswick. A 450-ft. lower tunnel is being driven to strike the vein at depth. In the old workings a rich shoot has been encountered in the drifts on the Remington vein. Edward McGrew is superintendent.—The Grizzly Gulch M. Co. is developing a good ore-shoot in the Truseutt. The main vein is 8 ft. wide. E. P. Sherk is superintendent.—Large bodies of fair-grade ore have been developed in the Sugar Loaf. A good force of men are employed and a reserve of ore is being blocked out. George Graves is superintending operations.—The Great Western Co., operating the Afterthought mine and Ingot smelter, announces that work will shortly commence on a railroad from their properties to connect with the Bella Vista line.

Redding, Sept. 7.

The Gold Leaf M. Co. has secured the right of way over the Eureka Tellurium land for its trolley tram. Within a few weeks an electric locomotive will be hauling 100 tons of ore per day from the Gold Leaf mine to the ore bunkers at Middle Creek station. H. O. Cummins is manager for this company, and of the White Oak and Milton mines. Over 125 men are working in the Lower Springs district.—The big rock crusher is being set up at Kimberly. This machine will do coarse crushing preliminary to loading ore in the tramline buckets, for the smelter. The tramway should be finished within a month; William Raymond of Salt Lake has charge of the construction.—Work has commenced on the 8,000-ft. extension of the Holt & Gregg narrow-gauge railroad, to the Golinsky mine. This mine has been held under bond for a year, but there has been some dispute as to the possession of the ground where the tunnel starts, so no copper ore has been shipped for some months.

TRINITY COUNTY.

(Special Correspondence).—A 20-stamp mill and a cyanide plant have been installed at the Golden Jubilee, on Coffee creek. The vein is holding out well and some of the ore is rich and is being shipped to the Selby smelter. Much development is under way. W. L. Chapman is superintendent.—Three tunnels are in good ore at the Poeth. A shipment to the smelter went \$250 per ton. A ditch with a capacity of 350 in. is being dug from Boulder creek to furnish power for the surface machinery, which will soon be

installed.—A Philadelphia company has acquired a two years' bond on the Headlight, and is driving the lower tunnel to tap the main orebody at depth. The ore carries copper and gold and will be treated at the smelter.—At the Bonanza King, the mill is running at full capacity on excellent ore. The lower tunnels are being extended, the ore-shoot holding out well.—A four-foot vein of free-milling quartz has been struck in the lower level on the Keating. A new wagon-road is being built.—At the Dorleska a promising vein is being developed. The new plant was recently installed.—It is reported that the Brown Bear will shortly pass into the hands of the Bullyhoop company. The Brown Bear was once one of the largest gold producers in this part of the State.

A crew of men is working claims northwest of Minersville, for James Hulme. An old channel of Trinity river can be traced on the ground.—Two pocket prospects are being worked near the Fairview, one by George Giddings on the Trinity river, five miles above the mouth of Stuart's fork, on a slate-porphry contact, and the other is worked by R. J. Laird, who has run a 75-ft. tunnel on a contact.

Carville, Aug. 30.

TUOLUMNE COUNTY.

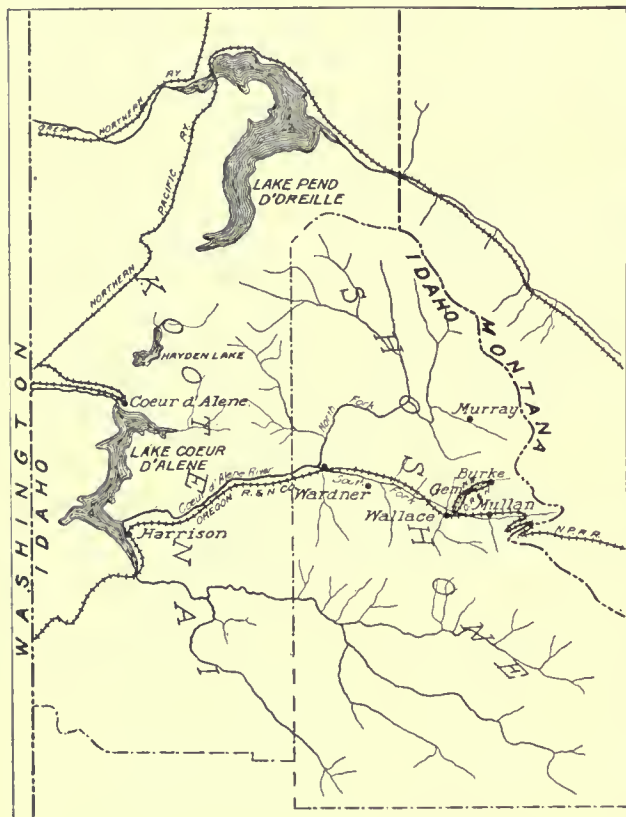
The Eagle-Shawmut M. Co. has purchased a 200-hp. Ingersoll-Sergeant air-compressor. A triplex electric pump is being erected on the 600-ft. level of the Shawmut mine.—Samuel Harris, representing La Fiesta G. M. Co., an English corporation that recently bought the Kanaka mines near Groveland, has ordered a 10-stamp mill from the Angels Iron Works.—The strike made last week in the Iron Spring mine, on Hunter creek, still holds. An 18-in. vein carries some good ore. The mine is owned by E. Caldwell and Thomas Armstrong of Santa Cruz.

IDAHO.

SHOSHONE COUNTY.

Mining claims within a few miles of Mullan, located by C. M. Delgrove and A. T. Davis, of Spokane, have been taken over by a mining and power company in Spokane. Articles of incorporation of the new company show the capital stock to be \$1,500,000. Work on the development of the 14 claims will be started at once. The concern will be known as the Copper Face M. & P. Co. The incorporators are: J. P. Webster, W. H. Honefenger, A. T. Davis, C. M. Delgrove, and W. S. Martin.—The lower tunnel, driven to cut at depth the Hunter vein, has broken into an orebody. The strike is considered one of the most important made in the Mullan district since the National strike. At last accounts the cross-cut, which is 12,500 ft., has exposed 18 ft. of ore, 7 ft. of which is galena ore of good grade. The rest is low-grade ore, which will average between 6 and 7%. The strike is within 30 ft. of American Commander end line.—E. S. Clark, of the Mullan Investment Co., controlling the Daisy, Carney Copper, Derby, and Glen Metals, announced that shipping of ore from the property will begin at once. The Daisy, three miles east of Mullan, is a good looking proposition. Ore showings have been made there that are surprising. The upper tunnel on the Carney Copper has been driven in between 600 and 700 ft. They expect to strike the ore at a depth of 800 ft.—John H. Nordquist, president of the Idora Mining Co., says the first carload of ore will be shipped in a few days. This is the first shipment in 10 years. The ore will go to the Panhandle smelter at Ponderay.—The Independent Copper Co. has elected these officers to serve for the ensuing year: President, James Bean; vice-president and manager, J. H. Nordquist; treasurer, C. D. Miller. The directors are James Bean, J. H. Nordquist, Henry Nilberg, D. F. Clark, R. R. McCormick, August Matt, and H. Leithend.—The Surprise Mining Co. has completed the new concentrator building on that property on Pine creek, also the air compressor and the engine. The other machinery, including crushers, jigs, vanners, tables, and screens, is on the way and everything is in readiness for its installation as soon as it reaches Wardner. The mill will have a capacity of 75 tons per day, but it is so constructed that the capacity may easily be increased to 300 tons. The company has three new 350-lb. air-drills and five small machines for stoping. Shipments of ore will be

begun as soon as the mill is completed. The concentrates will be hauled by wagon to the Pine Creek spur of the Oregon Railroad & Navigation Co. M. J. Sinclair, one of the principal owners, is supervising the work.—Under the supervision of C. Horton Hart, the mineral and ore display in the Spokane Chamber of Commerce quarters promises to be the best in this part of the country, if not in the whole United States. Every mine tributary to Spokane will be asked to send 20 lb. of its ore, and fill out a blank descriptive of the ore and the mine it came from, the purpose being to promote the industry by showing the resources of the districts.—Negotiations have been completed with the Rex Mining Co. and individual stockholders of the mine whereby B. M. Francis, of Spokane, and several New York and Montana associates, secured 775,000 shares, the controlling interest in the property, paying \$225,000 for their holdings.



The Coeur d'Alene, Idaho.

The mine, near Wallace, will be opened at once. It has been idle for six years because of unsettled litigation. They will immediately put three shifts of men at work, open and remodel the concentrator, which has a capacity of 200 tons per day; install new hoisting machinery on the second ore-shoot in the lower tunnel and immediately commence to sink 300 ft. lower. A three-foot vein of shipping ore is in sight in the face of the old tunnel. Within a year the mine will be paying dividends. Thomas Jay, superintendent of the Monitor mine, will be superintendent.—By the sale of the Croesus, Mantle Fraction, and Bullion lode mining claims at public auction at Wallace, by the order of the district court, \$25,700 was realized, and the suit of Lee Mantle against H. L. Frank, Walter Blossom, and others for a partition of the claims was brought to a close. Mantle bought the claims, paying \$17,500 for the Croesus and \$4,100 each for the others. The value of the claims, which are situated in the Eagle mining district, is shown by the fact that the area of the Mantle fraction is only two acres. John H. Wourms, E. P. Candec, and J. A. Reeves were appointed referees to partition the interests.

The Tiger-Poorman mine at Burke will be closed down. This is one of the most famous of the old producers in the Coeur d'Alene, but is reported to be worked out. Some months ago it was supposed that a rich shoot of ore had been discovered on the 2,000-ft. level, but this has pinched out. A small force of men will be retained to carry on

prospecting, instead of the force of 150 men at present employed. The Tiger-Poorman was discovered in the early eighties, was sold in 1901 to the Buffalo Hump M. Co., and consolidated with the Empire State company, and in 1903 these were all taken over by the Federal M. & S. Co. The concentrator at Burke, with a capacity of 400 tons per day, but which has for some time been in a rather bad state of repair, has been closed.

NEVADA.

ESMERALDA COUNTY.

The production of Goldfield for the week ending September 7 was unusually light. Factors contributing to this decrease were the closing of the mines on Labor day, and the lack of shipments from the Mohawk and Combination mines. The Nevada Goldfield Reduction Works received 647 tons; Western Ore Purchasing Co., 919; total output, 1,566 tons, with an estimated value of about \$285,000. No ore was shipped to the smelters during the week. The settlement of the labor troubles will increase the output for the coming week.—The Nevada Goldfield Reduction Works received ore as follows: Mohawk-Combination, 336 tons; Little Florence, 134; Red Top, 145; Rodgers-Goldfield Syndicate, 32. Total, 647 tons. Total mill value estimated at \$80,875.—For the same week the Western Ore Purchasing Co. received consignments of ore as follows: Mohawk-Jumbo, 707 tons; Hayes-Monnette dump, 161; Florence L. & M. Co., 51. Total, 919 tons. Total mill value estimated at \$104,875.

The Little Florence is reported to have run onto a good shoot of ore on the 400-ft. level, about 225 ft. from the incline shaft. A new vertical shaft may be sunk from the crest of the hill, to the 500-ft. level.—The shaft on the Commonwealth ground is down 400 ft., and but little water has been encountered. The diamond-drill operations will soon be resumed. W. E. Meyers is the superintendent, and has 10 men under him. The foundations of the Florence mill have been completed, and the superstructure is being raised at the collar of the company shaft on the northeast slope of Red King hill. A cement-lined reservoir has been built above the mill, with a capacity of 350,000 gal. The mill will consist of two units of 20 stamps each, the stamps weighing 1,000 lb., and having a 6-in. drop. The ore-bins have a capacity of 500 tons. The sand and slime will not be separated, and there are many cyanicides in the Florence ore.

NYE COUNTY.

(Special Correspondence).—The Bullfrog Consolidated M. Co. of Nevada has secured control of the Silver King and Clara B. groups in the Bare Mtn. region. The groups contain eight claims. A tunnel will be driven on one of the cross veins. R. V. Perkins is general manager.—In the Gold Bullfrog, the vein in the cross-cut from the tunnel has widened to 8 ft. The 35-ton Standard mill has been installed and is ready for service. The first unit of the cyanide plant is being constructed.—At the Gold Bar the shaft is down 500 ft., with 4,860 ft. of underground work. Good ore is being developed in the lower levels. L. P. Bedford is general manager.—The new pump has been installed at the Montgomery-Shoshone. It will supply water for the mill from a pumping station one mile from Rhyolite. The Bush Brothers of this place have bonded the Orient group of six claims in the Ibex district.—The West Extension and Bullfrog Teddy are being examined by C. J. Moore. The company is planning to commence development work on both properties. The shaft on the west end of the Delaware claim of the West Extension will be sunk to the 200 level and a hoist will be installed. Drifts will be run to connect this shaft with the main working shaft on the other side of the hill.—At the Homestake King, a large body of fair-grade ore is being developed. The company has ordered a 20-stamp mill for the property.—At the Mayflower, the vein is holding out well and some rich ore is being developed. Driving is under way on the main ore-shoot.—At the Tramps Consolidated some ore is being blocked out, with considerable exploration work under way.

Rhyolite, Sept. 5.

OREGON.

JACKSON COUNTY.

Work is progressing at the Alta Consolidated property, near the State line. Frank Morrin is in charge. There are six claims in the group, a shaft is down 250 ft., and several hundred feet of work has been done. A 30-ton Huntington mill and cyanide plant are in operation. Frank Blevins is mine foreman.—James Milner of Los Angeles is in Ashland, looking for black sand propositions.

WASHINGTON.

OKANOGAN COUNTY.

(Special Correspondence).—Another vein, 27 ft. wide, has been crossed by the adit of the Palmer Mountain T. & P. Co., in Palmer Mtn., at a depth of 1,600 ft.—A blind vein 22 in. wide has been encountered on the 112-ft. level of the Olentangy mine, near Chesaw. The ore assays \$38 per ton in gold, silver, copper, and lead. Six men are employed installing a hoisting engine and air-compressor plant. The working force will be doubled within a month, and the company hopes to begin shipping ore within 90 days. John H. Arnold, of Columbus, Ohio, the president of the company, is visiting the mine.—At the Grant Consolidated mine, 18 men are employed. The lower adit is in over 300 ft.—The Ben Harrison mine is employing six men and has installed a new power hoist.—Water has been turned on at the Allen placers, on Mary Ann creek, and the management expects a big clean-up.—The Molson Mining Co. expects to start up its new mill on the Poland-China mine, about Sept. 5.—The Chelsea group, on Texas creek, Twisp district, has been bonded to D. H. Cramer, representing Ohio people, for \$25,000. The bond runs three years, with a stipulation requiring the vendee to drive 500 ft. of adit each year.

Republic, Sept. 2.

BRITISH COLUMBIA.

The deputy sent by the government to investigate the coke shortage, has visited Trail, Nelson, Kaslo, and Fernie, and will report on conditions as he found them, within a few days; the operators are hoping that this will lead to some prohibitions regarding the exportation of coke by the Crow's Nest Pass Coal Co.—During the week ending August 31, the Rossland mines shipped and crushed the following tonnage: Centre Star, 1,840 tons; Le Roi, 980; Le Roi No. 2, 315; White Bear, milled, 350 tons. Total, 3,485 tons of ore.—Le Roi sent its first consignment of ore to the smelter since a month ago, billing it to the Northport plant. The winze workings are being put in shape for stoping, and general development is proceeding.—The Centre Star shipments were curtailed by the limited capacity of the Trail smelter, but the ground is opened up so that the production can be greatly increased at short notice.—The White Bear sent a carload of concentrate to the Trail smelter, the result of putting 350 tons through the mill. William C. Fox, a large shareholder, recently visited the property.

The Trail smelter received 4,917 tons of ore during the week. In addition to the ore sent from Rossland, the following companies made shipments: Snowshoe, Phoenix, 1,736 tons; Victoria, Nelson, 97; Whitewater, Ainsworth, 151; Second Relief, 42; Arlington, Slocan, 34; St. Eugene, Moyle, 26; Arlington, Erie, 23; Vancouver, 21; Sunset, 21; Reco, Slocan, 18; Payroll, 18; Forget, 250 tons.—The smelter at Northport received 980 tons of ore during the week from Le Roi mine. The receipts of coke continue, and in a short time there may be sufficient to justify the restarting of the smelter.

The output of the Boundary district for the week was as follows: To Granby smelter from Granby mines, 8,843 tons; from Emma, 150 tons. To B. C. Copper Co.'s smelter from Mother Lode, 4,343 tons; from Snowshoe, 2,400 tons. To Dominion Copper Co.'s smelter from Brooklyn, 512 tons; from Idaho, 672; from Rawhide, 2,656; from Sunset, 1,295; from Mountain Rose, 210 tons. To Trail smelter from Snowshoe, 1,700 tons. To Nelson smelter from Emma, 30 tons. Total shipments for week, 22,811 tons. Total ship-

ments for year to date, 787,893 tons.—This week Boundary smelters treated ore as follows: Granby smelter, 13,180 tons; B. C. Copper Co.'s smelter, 6,525 tons; Dominion Copper Co.'s smelter, 5,345 tons. Total treatment for week, 25,050 tons, and for year to date, 774,296 tons.

The smelters in the different districts received ore as follows during the week: Boundary, 22,855 tons; Rossland, 2,728; east of the Columbia river, 2,290 tons. The different smelters received the following consignments: Granby, 8,993 tons; Greenwood, 6,743; Boundary Falls, 5,365; Trail, 4,895; Nelson, 115; Northport, Washington, 980; Marysville, 600 tons. Total, 27,671 tons of ore.

News comes to Vancouver of the strike of a large body of medium-grade ore in the 500-ft. Jane tunnel of the Britannia mine on Howe sound. The ore has already been cross-cut for 100 ft. Some good copper is showing in the cores obtained from the diamond-drill working on the Britannia.

An option has been taken on the Bella Coola mine for \$250,000. Some copper ore has been taken out of the tunnel.—Some samples of coking coal have been brought in from the north fork of Granite creek. A 200-ft. tunnel has been run on the seam. A Colorado company has a bond on the property.—The output of the Nicola Coal & Coke Co. will be 1,000 tons per day before the end of the year.—Ten men are employed at the Golden Eagle property near Volcanic Mtn., 12 miles from Grand Forks, which was recently bonded by Vancouver men. A good vein was struck at the 70-ft. point in the shaft.

MEXICO.

CHIHUAHUA.

The Granadena mill has resumed operation, after a two-week shut-down on account of lack of fuel. The capacity of the plant is about 80 tons per day.—The new hotel, being built by the company for the employees of the Minas. Tecolotes y Anexas, is nearly completed.—The deal for the lease of the Palmilla mine has not been closed by Eugene Davis or G. C. Beekman who represent capital here, but work continues at the mine under the superintendence of P. W. K. Robertson.—The new 250-ton furnace of the Encinillas M. & S. Works of Sta. Rosalia, is to be erected at once, and a second one will be ordered. R. J. Morambert is the manager.—It is said that F. A. Heinze's engineers have been examining the Potosi mine and the properties of the Chihuahua Mining Co., all in the Sta. Eulalia district, with a view to purchase.—The Dwight Furness Co. has sold the San Gregorio mines to a New York corporation, together with an option on the San Gregorio railroad extending from El Chorro to Marill. H. H. Miller represents the company.—Frank Holmes, manager for the Oxnam Prospecting Co., operating near Guazapares, has been made manager for the Palmarejo & Mexican Goldfield, Ltd., to succeed W. A. Pomeroy. Arthur E. Stillwell will bring a party of 80 shareholders in the K. C., M. & O. R. R., to Chihuahua in a special train, within two weeks. Later they will proceed to Mexico City.

ZACATECAS.

The Mazapil Copper Co., operating at Concepcion del Oro, in this State, is developing into a great copper property. The capitalization is \$6,000,000, and it is said that 60% of this amount has been paid out in dividends. Last year the mines produced 8,000,000 lb. copper, 750,000 oz. silver, and 10,000 oz. gold, and this will be increased greatly this year.

The company owns 2,000 *pertenencias*, and employs nearly 8,000 men. About 12,000 tons of copper ore are produced per month, and smelted at Concepcion del Oro, and 9,000 tons of lead ore, which is stacked, to be treated in the new lead smelter recently built at Saltillo, in Coahuila, which has a monthly capacity of 10,000 tons. The copper smelter will be enlarged to have a capacity of 1,000 tons per day, and a 150-ton net concentrating plant has been built at the mines. A 1,500-m. tunnel has been started, to tap the Arauazau mines 200 m. below the present workings, which are about 500 ft. below the surface.—E. P. Merrill is the manager

Special Correspondence.

Butte, Montana.

The Machinists Strike.—A Few Mines Suspend Work.—Discovery in the New Boston.—North Butte Extension.—Smelters Restrict Purchase of Ores.—Mining at 2,800 ft.—Operations on the Parrot.

The machinists of Butte twice within two days rejected, by an almost unanimous vote, the propositions of the mining companies to settle the strike and permit resumption of operations at all the mines. The machinists struck on August 1 for an increase of wages from \$4.50 to \$5. Some months ago the mining companies offered them \$4.75, which offer was refused and the strike resulted. Through the impairment of machinery, operations at the mines have been hampered. James Stratton, of Washington, D. C., an executive officer of the International Association of Machinists, was called to Butte to bring about a settlement. He had a conference with some of the mine managers and received from them an offer to pay the men \$4.75 per day and waive a time contract, which had been demanded for the machinists in the first place. The proposition was submitted to the machinists at a special meeting and was turned down by an almost unanimous vote. The following night the matter came before them at a regular meeting and was again rejected. "I think this is a good time to shut down all the mines," commented one of the big mine managers after the result of the vote was conveyed to him. That is what the mining and business interests fear will happen. It was expected that Stratton had authority to order the men to return to work if he found that their demands were unreasonable, but the machinists say he has no such authority.

The Gagnon mine, of the Trenton Co., which was compelled to close because of the machinists' strike, has resumed operations. The suspension has been made necessary by a break-down of the air-compressor at the Original mine, from which the Gagnon received its supply of air. The Gagnon has a small compressor of its own, which had not been in use, but it was pressed into service again and work in the mine resumed. The Gagnon, like all other mines of the Amalgamated Co., has reduced its ore output, little more than half the usual quantity being mined.

Operations at the Bullwhacker mine have been entirely suspended, pending the results of an experimental leaching test near Spokane. Several carloads of Bullwhacker ore have been shipped to Spokane to be tested, and if the result is satisfactory a leaching plant will be erected at the mine. The company claims there are 400,000 tons of oxidized ore in the mine above the 200-ft. level ready to be taken out. The Snowstorm Mining Co. near Mullan, Idaho, is operating one of these leaching plants with great success, being able to make a good profit with the price of copper between 15 and 18c. The Snowstorm ore runs much higher in copper than that of the Bullwhacker, the average assay of the latter being about 4%. —A strike of good ore has been made in the property of the New Boston Co., adjoining the property of the Boston & Corbin Co. The vein is reported to be six feet wide, 16 in. of which assays 10.6% copper, 42 oz. silver, and \$1.60 in gold. Three feet of the remainder of the vein assays 2% copper, 6 to 7 oz. silver. The strike was made at a depth of 150 ft. in the shaft. The New Boston is a Butte organization. The shaft is being sunk on the Daphne, one of the old claims of the Corbin district. The Corbin Wickes Copper Co. has also cut a vein at a depth of 90 ft. The vein contains about a foot of

high-grade ore. A cross-cut is 30 ft. into the vein but outside of the foot of ore the vein is only well mineralized at that depth.

The North Butte Extension Co. has completed its new surface equipment and it is working satisfactorily. The shaft is now down 200 ft. and Manager Ryan expects to make a record for sinking during September, if there are no accidents. He feels confident that at a depth of 500 ft. good orebodies will be opened. A cross-cut will be run at that depth. The indications have been good from the surface, and it is the general belief that some of the rich veins of the hill strike through the North Butte Extension ground. The company is well prepared to handle any amount of water, and no trouble is anticipated from that source.

As a result of the refusal of the smelters and ore-buyers to take any large amount of ore from the small companies and independent operators in the Butte district, many of the small mines have been compelled to close, while the output from other mines is restricted. Among the companies thus affected are the La France, East Butte Extension, Bullwhacker, Farrel, Alliance, and lessees in the Ophir, Amazon-Butte, East Butte, and several other mines. With copper at 20c. the small companies and lessees could sell their ore to the smelters and make a good profit, but at 18c. they cannot do it, even were the smelters willing to take the ore, which they are not. The Alliance had been making a good profit from shipments of from two to four cars per week, from which the company had been paying running expenses and development work. The ore being comparatively low-grade, it has been decided by the management not to raise any more until either the price of copper advances or the company has funds with which to build a concentrator. The Farrel Co., which is using the Alliance shaft during the work of cross-cutting on the 200-ft. level, has also been compelled to cease work, because of the shut-down of the Alliance. The officers of both companies are confident of the value of their ground, as it has been demonstrated that good orebodies exist on the 200 and 300-ft. levels, and they believe that before many months they will produce ore of commercial value. Thus far the stringency in the money market, the fall in the price of copper stocks, and in the metal itself have had no effect on many of the new development and exploration companies working in the Butte district. Satisfactory progress is being made by the East Butte, Amazon-Butte, Butte & Bacorn, Butte Central & Boston, Butte & Balaklava, Butte & Superior, Butte-Milwaukee, and British Butte companies.

The station at the 2,800-ft. level of the High Ore mine is nearly completed and cross-cutting at that depth will begin as soon as the pumping machinery is installed. With the opening of the orebodies at the 2,800, the Anaconda Co. will have 400 ft. of stoping ground in the High Ore, as no other cross-cutting has been done below the 2,400-ft. level. The object in going to the 2,800-ft. point without cross-cutting at the 2,600 is to drain the ground of the High Ore as well as handle the water from adjoining mines.—The Parrot Co. has begun mining in the Little Mina, and after a shut-down of that property for seven years it is again productive. The ore from the Clear Grit mine is also being raised through the Little Mina. Heretofore it has been hoisted through the Mountain Consolidated shaft. The Little Mina is expected to contribute materially to the production of the Parrot Co., for it contains a good vein of copper ore. The shaft is 1,000 ft. deep, having been sunk 200 ft. during the past few months. The shaft on the Parrot is also being sunk deeper, and is now down about 1,980 ft. At the 2,000 a station will be cut and cross-cuts started to

the veins. From the upper workings the mine yields about 300 tons of ore per day, and the veins at the 2,000 are expected to add materially to the output.

Joplin, Missouri.

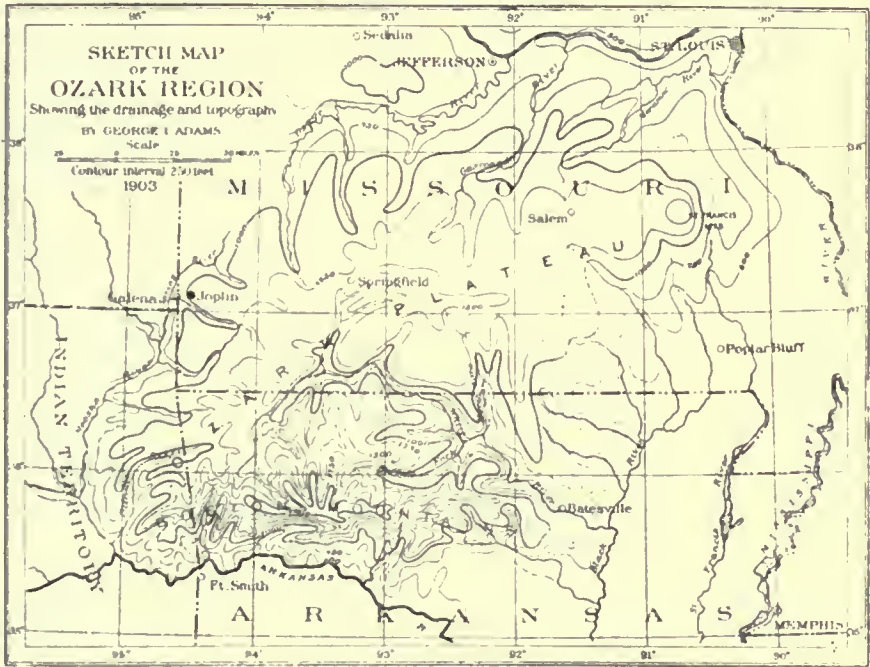
Lower Prices for Zinc and Lead Ore. — Steps Taken to Curtail Output. —Statistics.—The American Mining Congress.

The highest price paid for zinc ore last week was \$46 per ton, and for lead ore \$62 per ton. The top price paid for zinc the first week of the month of August was \$50 per ton, and the assay base price was \$44 to \$47.50; the top price has declined \$1 each week, and the assay base has dropped to \$40. This price prevents many of the big sheet-ground mines in the Webb City district from running, at least they cannot make any money, and some cannot meet expenses. Last year at this time, as is nearly always the case, the price was down, but the price of lead was about \$20 per ton higher than at the present

the best remedy at hand to stay the downward market. It will work a hardship on the working-men and impair business to some extent, but in the end it is the only thing to do. There are agents here now from the West shipping men to Colorado and Idaho, and it is claimed 300 have gone thither since Saturday night. This will be hard on the mines here when they are ready to start again, as it will take some little time for all those that shut down to get a complete complement of men, but on the other hand a light production should help the market for ore.

The committee having in charge preparations for the American Mining Congress will meet in the Commercial Club rooms in this city on September 6 to outline plans for carrying on the work that is necessary before the big meeting. James F. Callbreath, Secretary of the Congress, will arrive here from Denver, and Dr. Buckley, the State Geologist, will also be in attendance. Secretary Gregory of the committee is receiving letters daily

from all over the country asking for the reservation of rooms at the new Connor hotel, which is to be completed in time for the Congress. Los Angeles will be well represented by a committee from their Board of Trade, who will make a strong effort to get the Congress in that city in 1908.— For the first time in its history the Missouri-Kansas mining district is to have a mining exchange. The organization was perfected last night at the rooms of the Joplin Commercial Club.



Map Showing Position of the Joplin District.

time, and as the sheet-ground is rich in lead, these mines were able to make a little money, but with zinc and lead both down it is a different matter entirely. The stock in the bins has averaged from 5,500 to 7,000 tons for the past four months, a condition that is in itself a menace to ore prices. A restriction of the output during July would have been, seemingly, a proper thing, and would have prevented at least half the loss the district has sustained. This loss, by lower prices, now aggregates over half a million dollars.

Shipments.	Zinc, lb.	Lead, lb.	Combined value.
Week of August 31	9,307,330	2,341,010	\$ 281,057
Previous week	9,119,450	1,723,410	237,824
Month of August	50,270,190	8,991,110	1,355,530
8 months this year	413,343,550	63,846,410	11,958,846
8 months last year	339,478,500	52,508,070	9,986,729
Increase	43,865,050	11,338,340	1,972,117

A large number of the big producers met at the Newland hotel in Webb City, on August 30, for the purpose of devising some plan to stop the downward tendency of the ore market, and it was agreed that the proper thing to do was to shut down the mines for four weeks. The producers present represented about 3,000 tons output per week. A committee was appointed to make a canvass of the entire district and procure the name of every producer to aid in the shutdown movement, in order to make it general. The decrease of production seems to be

\$1,467,850, made up as follows: Sale of Cobalt Lake property, \$1,085,000; sale of Kerr Lake property, \$178,500; royalties from O'Brien mine, \$170,852; royalties from Cobalt Townsite, \$3,189; royalties from Right-of-Way, \$30,309. This is in addition to receipts in the ordinary way from the sales of mining land.

Another attack has been made on the title of the Cobalt Lake Mining Co., which was confirmed last April by a special act of the Legislature. This legislation is still liable to be set aside by the Dominion Government as *ultra vires*, the action brought by the Florence Mining Co. who claim the property on the ground of prior discovery being in the meantime suspended. The present suit is brought by James J. McConvey who asks for an account of all dealings by the directors with respect to the assets; the cancellation of all stocks not paid for at par; for damages for improperly procuring the passage of the act guaranteeing the company's title "which by implying the invalidity of the title to the property of the said company and the validity of the adverse claims thereby depreciated the value of the shares;" and for damages for wrongfully issuing shares at a discount. The Court is asked to appoint a receiver.

There is some excitement over discoveries of native copper and silver on Michipicoten island in Lake Superior some 15 miles from Sault Ste. Marie. Gordon Mi-

Toronto, Canada.

Government Profits From Mining.—An Important Suit.—Finds on Michipicoten Island. — Shipments From Cobalt.—Abitibi and Larder Lakes.— Another Goldfield.

The receipts of the Provincial Government of Ontario from the Cobalt mines so far amount to

chael, of Sault Ste. Marie, has been prospecting there since the spring and has recorded a number of claims. He brings samples showing native silver attached to native copper. H. C. Wilmot, who has examined the samples, says that the specimens of silver are as good as any that have come from the Montreal River district. Michipicoten island, he states, is geologically like the Keweenaw peninsula, and there is good reason to believe that native copper deposits, similar to those at Calumet, may be found there.

Shipments of Cobalt ore for the week ending August 31 amounted to 225 tons, from the following companies: Buffalo, 50 tons; Coniagas, 80; Kerr Lake, or Jacobs, 30; Nipissing, 32; Tretheway, 32 tons of ore.

At the Foster mine a mineral rich in silver and supposed to be argentite, which occurs in small quantities from the surface to the 50-ft. level, has been identified as stromeyerite. In contact with it has been found a new mineral known as gyropyrite, an amalgam of the sulphides of silver and iron. The Rothschild mine has been shut down for some time, work being unprofitable, but in prospecting a new vein has been struck containing some silver nuggets, and this may cause work to be resumed. The Colonial mine, which has been closed down since the strike began, has been re-opened and three drills are running. At the Right of Way the new shaft is down 57 ft. and will be continued 50 ft. farther, with a cross-cut at 75 ft. to the vein.—The new plant of the Rochester is in operation. The main shaft is down 80 ft. and ore is being taken out running from 2,000 to 3,000 oz. of silver per ton.—A new calcite vein with good silver contents, has been found running parallel to the main vein.—Work is being rapidly pushed at the Hazel-Jule property on Sasaginaga lake. Trenching to the extent of 1,500 ft. has been done and seven good veins found, one being about 20 in. wide with a good showing of silver. D. M. Gilpin is superintendent.—At the Edison mine, which has been worked for cobalt, a vein about 10 in. wide with good silver contents has been found at 150-ft. depth.—The main shaft of the United States mine is down 45 ft. on a wide silver-bearing calcite vein. Assays have shown 2,900 oz. silver per ton.

Last winter several gold claims were staked by Dan Mosher on islands in Abitibi lake. The La Rose interests secured an option and have been operating two steam-plants in developing the property. They have sunk one shaft 76 ft. on a vein 30 in. wide and are driving at that level. It is reported that a deal is practically arranged.—Development at Larder lake has been greatly retarded by delays in the delivery of plants ordered. At the Blue Bell a shaft is down 40 ft. and driving is being done. Free gold has been found on some of the properties owned by the Tighe syndicate.—At the Chesterville location on Northeast bay, a rich vein has been struck varying in width from 4 to 5 ft., which has been traced for 400 ft.—On the property of the Lincoln Nipissing Co. on the Southwest bay, a reef 200 ft. wide has been traced 900 ft., and free gold is visible in many places. A plant has been ordered.

Night Hawk lake is at present the magnet of attraction for prospectors, who continue flocking to the new gold-field. Many locations have been taken up since the first discoveries were announced. Night Hawk lake is situated nearly due west of McDougall's Chute, which is 100 miles north of Cobalt on the Temiskaming & Northern Ontario Railway. From McDougall's Chute it is reached by a circuitous canoe route with numerous portages. The formation is described as soft diorite and chloritic schist. The discoveries were made on islands in the Northeast bay of the lake, and as development progresses free gold of the size of peas is being found.

J. A. Herman, who was the first mine superintendent of the Nipissing, has staked several locations, and a Detroit syndicate is developing several claims with encouraging results.

Cripple Creek, Colorado.

Strike on Gold Hill.—The Drainage Adit.—Rapid Progress.—Ironclad Clean-Up.—The Masterpiece Mines.—Base Ores From the Ben Hur.—Stratton's Independence Mill.

A rich strike is reported on the south end of the Mattie L. claim of the Mattie L. G. M. Co. on Gold hill. A shaft was started 22 ft. from the east line of the Anchoria-Leland property and at a depth of 6 ft. ore was opened in a porphyry formation. Assays giving over \$300 per ton were obtained from the vein, which is 18 in. wide and shows sylvanite in many places. The orebody is believed to be at the junction of two new veins. Good ore has at times been obtained from the north end of the property, but the grade was not up to that of the present strike. Peterson and Jones are sub-leasing from Ed. McKenzie, who has a bond and lease on this property.

The original dimensions of 8 by 10 ft. for the drainage adit will be adhered to. The rapid progress made by the El Paso Consolidated Gold M. Co. has led the committee, appointed to look into this matter, to re-consider the decision accepting bids for dimensions of 5 by 8 ft. The rock seems to be softer than for the first 300 ft., making progress more rapid than before, and when the water-course is tapped still greater advancement is expected. At the present rate 8,500 ft. of advancement can be done within a year.—As a result of operations in the drainage adit activity on properties on the line of the bore is evident. On Cowan mountain a contract to drive the Peabody tunnel 200 ft. from the present heading has been let to Thier & Hull. The heading is already 1,200 ft. from the portal. Other properties in this neighborhood are undergoing development.

After a two-weeks run by the Ironclad M. & M. Co. a clean-up has been made which gives a gold retort of the value of \$3,016. The mill treated 1,050 tons of ore of an average value of \$2.85. Semi-monthly clean-ups are made at this mill, producing substantial profits.—Another mill for Ironclad hill is reported to be under consideration. Charles M. Kurie of Colorado Springs is said to be drawing up the plans for a 50-ton cyanide plant to be erected on the Pessimist property.—The new mill of the W. P. H. is expected to be in operation within a week if material, which is on the way, is not delayed. Ore is now being hoisted from the shaft of the W. P. H. Extension Co., situated at the west end of the property for treatment by the mill, which will have a capacity of 100 tons.—The Wishbone mill on the north side of Carbonate hill has entered the market for custom ores. It is the only cyanide mill in the district that crushes by means of stamps, of which there are 20, giving a capacity of 100 tons per day. There is a great deal of low-grade ore on the Sunshine, Black Diamond, and other properties adjoining, which can be milled at a profit.

The Masterpiece Gold Mines Co. is preparing to install a six-drill compressor at the Masterpiece tunnel on the eastern slope of Bull hill. This adit is 300 ft. long at the present time, and was driven to cut several veins that had been encountered in shallow shafts. The company is also preparing plans for a 50-ton cyanide mill. The property comprises 53 acres of patented ground, development of which has opened up large bodies of both smelting and milling ore. With the installation of the compressor, the property is expected to become a regular shipper. Lessees Richard Blanchard and C. B. Eaton,

operating the Little King claim of the Ben Hur property, on Gold hill, recently made a shipment of particular interest, as the ore shipped was different from that characteristic of the Cripple Creek district. This shipment, in addition to gold, contained silver, lead, and zinc. The ore was extracted from a space 30 by 18 ft. and about 200 ft. below the surface. Assays from the orebody were particularly good and returns from the shipment netted a substantial profit. It was the intention of the lessees to erect a 50-ton cyanide plant at the portal of the Good Will tunnel, but, owing to the improved conditions, it is announced that \$50,000 will be expended in the erection of a 200-ton plant. The lease has 15 months to run. Many pockets of high-grade ore have been encountered on Gold hill, but this one seems to be the most important in years.

The work on the Stratton's Independence mill is well ahead of the scheduled time. Enforcement of the card system and the Labor day celebration caused a scarcity of men for a short while, but a full crew is now at work again. Should the favorable weather of the past month continue, the superstructure of the mill will be practically in place by the end of September, and if machinery arrives promptly the work will be finished in advance of the time allotted for the construction of the first unit of the plant.

Vancouver, British Columbia.

The Fuel Problem in the Boundary District.—Scarcity of Coke.—Smelting Operations Crippled.—Action by Board of Trade.—A Comparison With Arizona.

The mining and smelting interests of British Columbia are making a vigorous attempt to solve the fuel problem that has confronted them for some time. It has been impossible to get a substantial stock of coke on hand at any of the smelters, and the operation of the plants has necessarily been irregular as they were dependent upon daily shipments of fuel to carry them along. One after another, they have been forced to close down for periods of time varying from a day or two, to several weeks. These irregularities have made mining operations equally uncertain, with the result that men have to be laid off, or changed from stoping to development work at short notice.

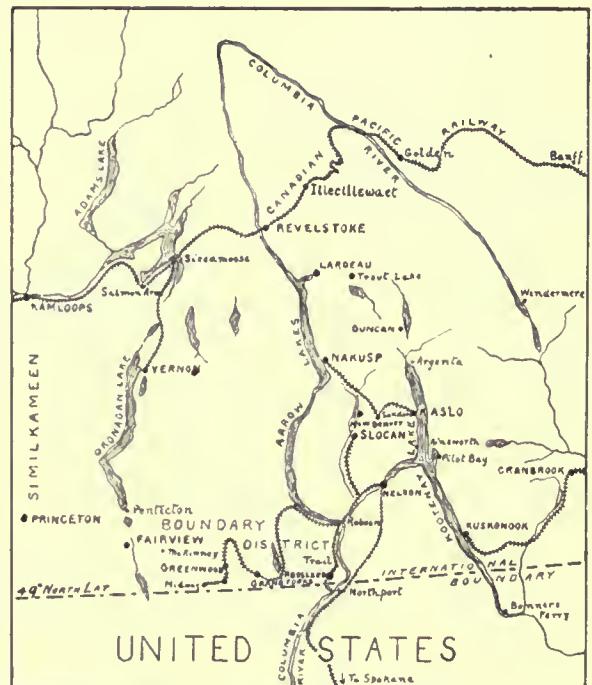
Recently, the matter has been called to the attention of Premier McBride, who promptly sent a deputy to the Kootenays to look into the situation. This deputy has visited Trail, Nelson, Kaslo, and Fernie, and is soon to report conditions as he found them. In view of the bad effect that this insufficient supply of fuel is having upon the mining industry throughout British Columbia, it seems unjust to the operators that coke should be exported to the smelters in Montana; they maintain that only the surplus above local needs should be sold across the line, whereas the records of the customs department show that up to August, the exports to the United States for this year have already been in excess of 27,000 tons of coke. It is estimated that this amount of fuel would have made it possible for the Trail and Boundary smelters to treat a quarter of a million tons of ore more than they did. The Nelson Board of Trade has adopted resolutions calling upon Premier McBride to stop the sale of coke by the Crow's Nest Pass Coal Co. to alien companies. The Rossland Board of Trade has followed, with a set of resolutions regarding this "serious menace to the mining industry," condemning the sale of coke to outside companies and the inadequate transportation facilities furnished by the railways, demanding that the Provincial Government take action in the matter, and suggesting the throwing open of 50,000 acres of Government coal

lands, preferably as a Government-operated coal mine. The Trail Board of Trade has just passed a resolution, asking that the provisions of the charter be enforced.

Another cause of the trouble seems to be the shortage of men at the collieries and coke-ovens, due to the fact that wages have risen in the metal mines, harvest fields, and lumber camps, until they are higher than those paid for this class of labor at Crow's Nest Pass.

Anyway, the people of Rossland and Boundary districts seem to be going about the correction of the shortage in a businesslike and energetic way, and backed in their demands by an independent press and the Provincial government, a speedy adjustment is hoped for. The Crow's Nest Pass Coal Co. has openly violated the terms of its charter, which provide that if a supply of coal and coke for Yale and Kootenay counties is not forthcoming in sufficient quantities for the smelters and refineries, the company shall pay a penalty of \$2 per ton in respect to the shortage.

The successful exploitation of the copper ores of southern British Columbia is known to depend upon production on a large scale. The tendency evinced by all the producers is to enlarge their smelting plants. The Dominion Copper Co. is already equipped to handle



Map of Part of British Columbia.

1,200 tons of ore per day; the Consolidated company, 2,000 tons; the Granby company, 3,000; and the British Columbia Copper Co., 1,200 tons per day. This combined capacity of 7,400 tons per day is sure to be doubled within the next five years if the industry is given a chance to expand. But before any such enlargements are justified, an adequate supply of fuel must be assured, and the successful settlement of the present trouble is vital to the future of mining in the region. Some of the plants receive coke from the Alberta ovens, but the Granby smelter at Grand Forks and the Consolidated plant at Trail, the two largest smelters in Canada, are dependent upon the Crow's Nest Pass company for their supply.

In contrast to the hand-to-mouth method of supplying these smelters with coke, comes the news of the washout of portions of the Gila Valley, Globe & Northern Railway in Arizona, over which is hauled the supply of coke for the Old Dominion smelter at Globe. Although all traffic may be suspended for weeks, and even the wires are

down, there is no cessation in the operation of the plant, as a supply of fuel is on hand sufficient for a protracted run. If the Canadian smelters could be assured of a regular supply and could carry a comfortable surplus of fuel on hand, the whole southern portion of British Columbia would benefit greatly thereby.

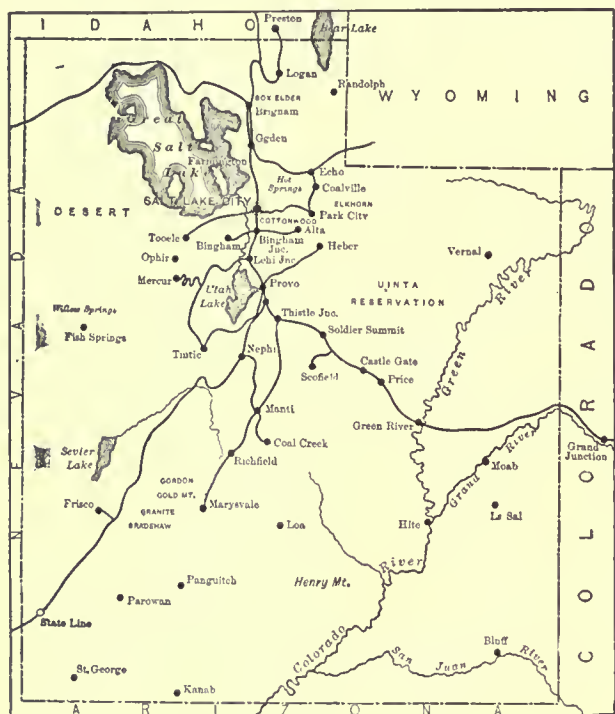
Salt Lake, Utah.

Operations at Bingham.—Boston Con. Mill.—Strike in the Standard.—

Consolidation of Mines at Park City.—Ore Shipments.—Ontario

Adit.—Eureka Railway.—Dividends.—Shipments From Tintic.

The Bingham-New Haven Mining Co. is about ready to operate its Bingham mine through the lower adit; but before doing so, it will be necessary to shorten the aerial tramway about 2,000 ft. At present the upper terminal is at the portal of the upper adit. Under the new arrangement the property can be worked more economically than heretofore and it will not be compulsory for the



Utah.

company to maintain a boarding-house.—The building of the aerial tramway over which the ores of the Yampa mine are to be conveyed to the smelter is progressing satisfactorily. It is expected that the system will be ready for operation in October.

The first section of the Boston Consolidated Mining Co.'s new concentrating mill will be ready within the next 30 or 40 days, and it is expected that the five sections of the initial unit will be in operation by the end of the year. This, of course, is contingent upon the Rio Grande Western supplying the required tonnage of ore—2,500 tons daily—from the company's mines at Bingham.

Lessees working in the Bingham Standard mine have opened a body of high-grade lead ore in the Saginaw tunnel, and shipments are being made to the Salt Lake smelters. The Bingham Standard company has cleared up the options on some of its possessions preparatory to transferring the assets of the corporation to the Bingham Central-Standard Copper Co., which organization is a result of the merger of the two mines. The stock of the old corporations is being transferred to that of the new one. Arrangements have been made with

the management of the Nevada Utah Mines & Smelters Co. for the use of the Last Chance mill at Bingham for the treatment of low-grade ore.

The merger of the Creole mine at Park City with the Uintah Treasure Hill has been concluded, the directors of the former agreeing to accept the same amount of stock in the Treasure Hill Consolidated Co. as they now hold, subject, however, to ratification by their shareholders.

The Uintah Treasure Hill Co. is now in possession of over 20 lode-mining claims which are situated between the town of Park City and the Woodside mine of the Silver King Coalition. It is claimed too that the Treasure Hill ground contains a continuation of the contact vein from which the Silver King has obtained a large portion of its riches.—The ore shipments from the mines of Park City during August amounted to about 10,000 tons, the contributing mines and respective amounts being: Silver King Coalition, 3,441 tons; Daly West, 3,739 tons; Daly Judge, 1,742 tons; American Flag, 396 tons; Little Bell, 246 tons; Copper Apex, 45 tons; other mines, 120 tons.

The work of re-opening the Ontario drainage adit is progressing tediously. Some time ago the management tried the experiment of using pumps to unwater the mine, but the plan has not proved an entire success. A drift is being run around the latest obstruction in the adit, and by the use of diamond-drills run ahead of the breast the men employed in that particular portion of the property are proceeding with their labors in comparative safety. The adit has been out of service for about two and a half years.—The grading of the Eureka railway, the new line to be operated in connection with the operation of the smelter of the Tintic Smelting Co.—now under construction—has been practically completed. The ties and much of the rolling stock has arrived, and the management has been advised that the steel rails have been shipped. The construction of the smelter is going along nicely and it is expected that both the railroad and the smelter will be ready by the end of the year.

The splendid results achieved through the development of the eastern portion of the Tintic district has caused mining men to look to the northern portion of the camp, where little systematic development has been done heretofore. Several new companies have been organized recently with strong financial backing. Engineers who have examined this part of Tintic recently are confident that money spent there in development will be productive of good returns.—The directors of the Uncle Sam Consolidated Mining Co. have posted a dividend of 3 cents per share, or \$15,000, payable this month.

The Daly West quarterly dividend of 60c. per share, or \$108,000, has also been posted for payment on the 15th inst.—The annual election of the City Rocks Mining Co., with properties at Alta, has been held and has resulted in the selection of W. S. Cleaves of Haucok, Mich., as president; John Edwards, Houghton, Mich., vice president; James P. Edwards of Houghton, Mich., secretary and treasurer; W. S. Zehring of Salt Lake, assistant secretary and manager.—Ore shipments from the Tintic district last week amounted to 140 carloads, the contributions coming from 22 mines, the mines and respective amounts being: Ajax, 4; Beck Tunnel, 8; Bullock, 1; Bullion Beck, 9; Carisa, 2; Cliff, 1; Colorado, 8; Centennial Eureka, 44; Eagle & Blue Bell, 9; Eureka Hill, 3; Grand Central, 6; Gemini, 5; Godiva, 2; Laclede, 5; Mammoth, 10; May Day, 5; Scranton, 8; Swansea, 1; United Sunbeam, 1; Uncle Sam Con., 4; Yankee Consolidated, 2 carloads.

Denver, Colorado.

The Card System.—Drainage Adit at Cripple Creek.—Ore Reduction at Lake City.—A Zinc Plant.—Local Politics.

The recent abandonment of the card system at Telluride has produced a not unexpected effect on the labor situation at Cripple Creek. At the same time that the bars were being let down at Telluride they were being put up at Cripple Creek; all the men in the camp were given until September 1 to take out new cards, no man without a card to be employed after that date. As a result several men have gone out, but as the labor market at Cripple Creek, in strong contrast to all the other camps of the State, is not short-handed, there is no reason to expect that there will be any trouble. A few timbermen at the Portland have gone out, demanding an increase of wage from \$3.50 to \$4, but as the Portland mill is now handling a certain proportion of Golden Cycle ore, according to their agreement, this will not even create any irregularity until the striking men can be replaced. For the first time in many years the monthly production of the district for the month past has fallen below a million dollars; this is due, of course, to the curtailing of the output of low-grade ore which was being shipped to the Golden Cycle mill. The U. S. Reduction & Refining Co. has reopened its mill at Florence, and has also rescinded the penalty previously placed on sulphide ore, as compared with the oxidized. This practically amounts to a lowering of treatment charges, and next month will probably show an increase in the production.

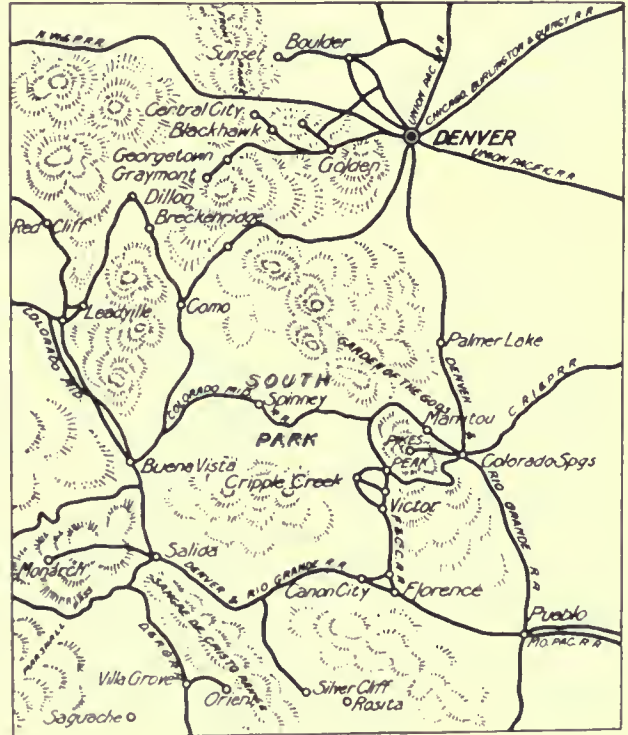
The driving of the deep drainage adit is now being carried on by the El Paso Mining Co., that company having taken the contract at a somewhat higher figure than the first contract. The adit has been advanced 540 ft. and is being driven at the rate of about 8 ft. per day. The sinking of the intermediate shaft is also progressing satisfactorily. A disagreement recently arose in the directorate of the El Paso company, one of the directors being dissatisfied with the way in which affairs were being managed, especially with respect to the tunnel contract. The recent meeting went off smoothly, however, the disgruntled member confining himself to threats of vengeance.

The Hidden Treasure mine at Lake City, which has produced valuable ore, but which has been idle for some little time, is expected to re-enter the rank of the producers as soon as the changes in the mill can be completed, \$50,000 being expended for that purpose. Most of the ore of Lake City offers a difficult problem for treatment. It is not high enough in grade to ship direct, or else it is prohibitively high in zinc. The local smelters have not been able to operate successfully, not being able to secure the variety of ores necessary to make an easy fluxing mixture. In addition, the district is remote from any adequate fuel-supply. To mill most of the ore is quite impossible, as the value lies chiefly in the silver contained in an argentiferous tetrahedrite, which slimes so badly that a prohibitive percentage is lost in the tailing. Even the extensive use of canvas tables and blankets fails to remedy this difficulty, although a decided advantage. Lately ore is being opened up on the borders of the district that is more amenable to treatment, and several good producers may result from this development.

The trial of the promoters of the Lost Bullion Spanish mines has finally been concluded, resulting in the conviction of all the defendants, although the penalties imposed are somewhat unequal. It was a case of particularly bare-faced swindle, and it is to be hoped that all similar promotions may receive similar treatment

from the Federal authorities. The States are helping in this movement, and Connecticut has recently been added to the list of those that have laws to protect the innocent investor from dishonest promoters.

The company which is to build a smelting plant at Canyon City to treat its own and other ores by the Lewis & Bartlett process, announces that it has secured a lease for 99 years on a site about a mile south of the Empire zinc plant, and that a satisfactory contract for the necessary coal supply has been concluded. The promoters have secured the services of a man experienced in the operation of the process, and expect to proceed immediately with construction work. Their entry into the ore market will be a decided benefit to the smaller mines



A Part of Colorado.

whose lead ores are too high in zinc to be acceptable to the smelters, and whose properties are not large enough to justify the erection of a mill.

With the coming of the autumn days the political situation again begins to assume interest. The recent speech of Secretary Taft in Denver was enthusiastically received by a large crowd, for it was marked by a breadth of insight, a calmness of judgment, and a fairness of spirit that could only appeal most favorably to the people of the State. The Secretary appealed equally favorably to the party leaders and is said to have brought harmony to the dissident factions. It would take more than even Mr. Taft's abilities to bring about a reconciliation between Gov. Buchtel and Judge Lindsay, however. These two belligerents have both returned to Denver from their Eastern trips, and the public will doubtless soon have opportunity to enjoy more spectacular use of language. Whatever the effect of Judge Lindsay's statements may have been, the Governor has probably sacrificed himself politically by his attitude in regard to the commandant of the Soldiers' Home, and by what are reported to be his statements in regard to the members of the Grand Army. Still, it is probable that the reverend Governor has served his purpose politically, and would have been retired at the end of his term in any case. Certainly, he will be retired. Just how Mr. Thomas F. Walsh will secure his own election to the United States Senate is also a matter for interested conjecture.

this gronand is diping to fast in to the sutheran gouter to doe much with till the water as becan taking of the sutheran leade. the Bore as duane no father with the Bore it stands at 350 i have to Bolers cleand i stoped them on wire from doane the remane to. i May state that this groun turn out Better thean i expted can to the goald Being threw the wash. Since i receved the wire i change to clacks and put in a nue Buck i all so put in ou Sundy the nue working Baril and evry thing is in good orde for taking out water wean reQured."

While the orthography of the above epistle will appeal to you to about the same extent that its immodesty will to Mr. Herzig, I am not without hope that, failing President Roosevelt, some keen advocate of phonetic spelling will signify his approbation.

All of which does not hinder me from expressing my sympathy, Mr. Editor, with your endeavor to induce more care in technical writing.

W. J. LORING.

Melbourne, August 1.

Weathered Pyrite.

The Editor:

Sir—I address myself to your valuable paper in the hope that the herein following query may attract the attention of one of our authorities on mineralogy.

To what can be attributed the fact that the croppings of bodies of iron sulphides in the desert region of California consist generally of hematite and magnetite; while in northern California they consist generally of limonite, carrying only occasionally hematite and magnetite, and then only in granular form?

Is it possible or probable that in the desert region these croppings were originally limonite, which was dehydrated by the existing climatic conditions? Or may the reason be that these iron sulphides were deposited by the mingling of solutions carrying metallic sulphates with solutions carrying salts of sodium, potassium, calcium, *et cetera*.

Bearing on this point, it may be noted that considerable calcitic material is associated with some of the anhydrous croppings in the desert region, and that the only anhydrous croppings observed by me in Shasta county are contiguous to the great body of Carboniferous limestone on the McCloud river.

WM. FORSTNER.

San Francisco, August 7.

Conveying Tailing in Launder.

The Editor:

Sir—I have read with much interest the description appearing in your issue of June 29, on conveying tailing in cast-iron pipe at Guanajuato, also the further statements on the same subject by Mr. Van Law in the issue of July 20. Having in the last two years made about 7,000 experiments on the carrying capacity of launders, the subject is of course interesting to me. In my experiments on tailings which were clean pure quartz and quartzite (probably much more angular and sharp than the material at Guanajuato) I find that on a grade of 1.5% in a rectangular launder on material of the fineness mentioned in your article one pound of water will only carry off 0.022 lb. quartz, when the launder has the most economical width for the quantity of material carried.

My experiments also show that with the most economical width of launder, the same material with water in the proportion of 7½ to 1 would require a grade of nearly 5%. Only on absolute slime did I obtain better results

in a V-shaped launder than in a rectangular one. My experiments were checked, some twice and some three times.

Why my results are so much lower than those mentioned, I would like to ascertain. I know Mr. Van Law personally and know the figures he has given can be nothing but correct, and the difference must be wholly in the nature of the two materials handled (this refers to the issue of June 29).

With your permission, and begging the pardon of my brother engineers, I can positively state that the "wetted perimeter" has nothing whatsoever to do with the carrying capacity (as far as solids go) of a launder. Personally, I was formerly under the impression that it had, but my experiments have conclusively proved that we have all been wrong in this assumption. For example, a 1-in. launder using 25 lb. water per min. will carry exactly one-half of the tailing of a 2-in. launder using 50 lb. water, and one-tenth of a 10-in. launder using 250 lb. water per min., all, of course, on the same grade; that is, the carrying capacity in sand, etc., is proportional to the width. This I can prove by figures from about 500 actual experiments. In the next statement I shall probably get myself into trouble, but Mr. Van Law's experience will bear me out.

Under the right conditions, material can be transported in a pipe. On a grade, we could not possibly transport it in an open launder, but the initial grade should be greater than the grade at the end (the sooner to develop pressure) which in an open launder would be bad practice. But, as a rule, we can only utilize a pipe on very fine material, and when handling comparatively large quantities. To make myself clear, if we attempt to transport in a pipe ½-in. material at the rate of 10 lb. per min. on a certain grade, with the least quantity of water, the theoretical size of pipe required would be so small that in a short time the pipe would clog, but to transport 100-mesh material through the same pipe would be easy. I know full well that pipes used in mills in place of launders, often give much trouble and it is not my purpose to recommend pipe in place of launders, except for carrying off great quantities of comparatively fine tailing. There is more to Mr. Van Law's expression, which I will quote, than most of us (probably even himself included) would think. "As soon as riffles of sand are formed so as to cause an obstruction in the flow, the pipe develops hydrostatic head above the point of obstruction sufficient to force the sand through." That is, if the pipe is too large to give the velocity of water that will keep the material in suspension (or carry it on the grade used) then nature itself, by the filling in of sand, reduces the size of the pipe down to the point where the velocity will be high enough to carry the material off, depositing it ahead again where velocity is slower, until this point in turn reaches the carrying stage, and so on. This action also shows to some extent in a launder, but the effect is not the same as in a pipe, because the launder can keep on filling up and water still flows on top, without increasing its velocity at that point. The carrying of tailing in a pipe and in a launder are two entirely different problems, and do not at all follow the same laws. In the pipe we depend mostly on the head developed, but in the launder on the rolling and sliding action down an inclined plane, except in the case of exceedingly fine material, where the hydraulic condition or wetted perimeter approximates the right proportion of a launder. I hope in another year to finish my investigation in regard to the problem of launder capacity and to present it in much better form than these ramblings.

G. A. OVERSTROM.

Salt Lake City, August 31.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

The Royal School of Mines.

The Editor:

Sir—In your issue of July 27, there is a letter from Mr. F. Lynwood Garrison, which is evidently based on imperfect knowledge of the facts connected with the incorporation of the Royal School of Mines with the new Imperial College of Technology, and as Mr. Garrison evidently writes with sympathy for the old R.S.M., he will, I am sure, be pleased to have some of his impressions corrected.

In the first place, Mr. Garrison has expressed surprise at the absence of protest by old School of Mines men against the change, and he has at the same time, poured ridicule on the whole scheme of the new Imperial College. If there is one thing clearly established, it is the intense interest which old School of Mines men have taken in the idea of an improvement of the School, to keep it up to date, and in the consideration of the proposed amalgamation with a general college of engineering, or rather technology. This interest has taken effect by means of the council of the Institution of Mining & Metallurgy, on which are a number of School of Mines men, including the present professors of mining and metallurgy of the R.S.M. The effective work of the Council is on record in its publications for the last four years, and it is well known that the Institution has exerted a very great influence in the appointment of a committee by the Board of Education, to examine into the present condition of the Royal School of Mines and the Royal College of Science, with which it is incorporated, and to advise as to means for improving their efficiency. In the submission of evidence to this committee, the Institution took an active part, and was represented on the committee. The recommendations of the committee (which have practically been completely carried out in the formation of the new Imperial College of Technology, with the preservation of the identity, the title, and the diploma of the Royal School of Mines) were fully agreed to by the council of the Institution, which is equivalent to saying that they were agreed to by the great majority of R.S.M. men, past and present students, who had taken sufficient interest in the matter to express opinions and offer services.

It is quite true that a majority of R.S.M. men would have preferred to see the School stand as an independent Government institution, and handsomely endowed by the Government or by individuals, so that new buildings, testing works, and reasonable salaries to professors could be secured. Conditions in London, however, were entirely opposed to this. There are a number of other schools of mining and metallurgy now established in England, and it was perfectly evident that a British Government would no longer take the position which led to the original foundation of the R.S.M., in spite of the fact that the British Empire is now producing something like \$400,000,000 from mining, other than that of coal and iron. As regards individual donations, London suffers from the disadvantage of being a world, and not a provincial city; there is no feeling of provincial pride among dwellers in London, and generally in England, large donations for educational purposes are less frequent than in the United States, where also such donations are often local in character.* A notable exception in the

present case is the gift of an aggregate of about \$1,000,000 from the members of the firm of Wernher, Beit & Co., the wellknown mining house of London, which sum has come into the possession of the new Imperial College of Science & Technology, and will insure proper buildings, at last, for the Royal School of Mines.

The new college will have annual grant from the Government, which hands over the Royal School of Mines and Royal College of Science, and it will receive further annual grants from the London County Council, the City guilds, and other sources, and it will be in a position to co-ordinate the highest technological training as well as to correct the present overlapping and heterogeneous management of scientific education in London. The names of the board of governors of the new college will be evidence sufficient that not only are pure science and educational ability well represented, but that there is plenty of industrial engineering talent of an eminently practical character to insure proper regard to modern progress, while the R.S.M. is strongly represented, and the coal and iron mining interests are separately represented.

From the above, it will, I hope, be seen that on this side, neither mining engineers generally, nor R.S.M. men particularly, are of Mr. Garrison's opinion that the new Imperial College of Technology is a "humbug," nor that its organization has been the "work of a parcel of politicians."

WALTER McDERMOTT.

London, August 23.

[This letter from Mr. McDermott is most timely, for he has taken so useful a part in the work of the committee appointed by the Board of Education that anything he says will be read with interest. We are glad to learn that the R. S. M. men in London approve of the new scheme, and perhaps if we were living there our accord with the new departure would be complete. As it is, looking at the matter from a distance, it still seems to us queer that London, the great financial centre of mining operations, and England, the mistress of a world-wide mineral empire, should be able to do nothing better than tack a historic School, honored by some of the greatest men of science, to a College of Technology of a nondescript character. The only good feature is the independence of the new School of Mines from the Board of Education. For the rest, while the school has been saved—thanks to Mr. McDermott and the Institution of Mining & Metallurgy—it has not received the treatment warranted by the relation it bears to the mineral industry of the British Empire.—EDITOR.]

On Technical Writing.

The Editor:

Sir—As an interested follower of the controversy between yourself and Mr. C. S. Herzig, I crave permission to add to the bone of contention by bringing under notice a mine manager's report to his directors. The fact that this interesting curio was discovered among the official documents of a mining company now under my control, disposes of any doubt as to its authenticity. I quote the report *verbatim et literatim*:

"to the Drectors,
"geantlemen—i ham fored you plan and you will see by it the Mount of worke Duan in it the west Drive has diped under foot and is making a good drope of water shoun it is goe fast in to the Sutheran leade it Dips 8 feet in 12 the wash a come down in the South Drive and with fare prospect After getting wire to stop i wash off to half Mechean for 6 oz 8 from sevean seets of drivean wich is very good i did not take up the Bottom of the Mechean if i had i wood have got over 7 oz i ham suare.

* In other large cities of Great Britain handsome donations for local educational institutions are not uncommon.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

THE Wilfley table was first used by A. R. Wilfley in his own mill at Kokomo, Colorado, in May, 1896.

SODIUM CYANIDE is equivalent to 124 to 128% active potassium cyanide, and is guaranteed to have a comparative efficiency of 125 per cent.

IN THE oxidized ore at El Oro, Mexico, the ratio of gold to silver is $6\frac{1}{2}$ grams of silver to 1 gram of gold; while in sulphide ore the proportion is as 15 to 1. This indicates the concentration of gold above water-level.

SHIPMENTS of Government tin from Java in 1906 amounted to 9,807 tons, as against 9,344 tons in 1905 and 11,749 tons in 1904, while the quantity of private tin shipped was 1,935 tons, as compared with 2,237 tons in 1905 and 3,077 tons in 1904.

THE hand jig is one of the cheapest and simplest washers, and can be put together with a few tools in isolated places; where labor is cheap, the cost per ton is low, and when the tonnage is low, the simplicity of the hand jig gives it preference over the more complicated and expensive power jiggling plants.

ANALCITE, a sodium aluminum silicate crystallizing usually in trapezohedrons, occurs with prehnite, datolite, and calcite, in the Lake Superior region; in the gangue of copper at Copper Falls; and at Michipicoton island. It is also found in New Jersey; in gneiss in New York; and in Maine, with apophyllite in greenstone.

IT is generally thought economical to build a mill or reduction plant near the mine, that is, within less than 500 ft., as getting the ore to the mill is an important factor. In the Lake Superior copper region, the mills are so large as to make it cheaper to haul the ore from the mine to the shore of the lake by railroad, even though the distance be from one to seven miles, because a cheap supply of fuel, ample water, and a dumping place for the tailing is thus gained.

THE CHIEF distinctions between pyroxene and amphibole are that the prismatic angle with pyroxene is 87° and 93° , and with amphibole 56° and 124° , while the prismatic cleavage is much more distinct in the latter. Pyroxene crystals are usually short prismatic and often complex in form, with a lamellar or granular structure of the massive kinds; while with amphibole, the crystals are chiefly long prismatic and simple, with columnar and fibrous massive kinds the rule. The specific gravity of most of the pyroxene varieties is higher than similar varieties of amphibole.

THERE may be some refined methods of 'spitting' fuses, but the commonest method in practice is to unwrap the tape for about two inches, then split the fuse exactly in two, preferably using a sharp knife with a thin blade and handling the end carefully in order that the powder may not be scattered. Then apply a candle, always having a lighted snuff near, as the flash may blow your candle out. When one fuse is going, if there are more within reach of it, they may be lighted by holding their ends to the burning one. In quarry or other outside work where the thing is feasible, a hot bar of iron makes a good lighter.

GYPSUM occurs in sedimentary rocks of practically all ages, either in the crystalline form or as rock gypsum, and it is widely distributed over the world. It is found

commonly in the vicinity of beds of rock salt. In the United States workable deposits are confined to beds of rock gypsum, which occur at comparatively few geological horizons. The gypsum beds east of Missouri river are, for the most part, in Paleozoic rocks, while those of the West are mostly of Mesozoic and Tertiary age. The white gypsum sands of Arizona and New Mexico are of fine-grained material that has been eroded from rock outcrops and worked by the winds into its present condition and position in Quaternary time.

THE lower-grade chromite ores are used as refractory basic linings for furnaces, both reverberatory and blast, and in the manufacture of chrome bricks for the same purpose. The Canadian ore is particularly adapted for furnace lining as the silica present in it is combined with magnesia. Strange to say the presence of a fairly large amount of silica was used as an argument against the Canadian ore when it first came on the market; but tests made by many steel companies in the United States show that this ore lasts nearly a third longer than foreign ores. The principal competitors of the Canadian ore have been the mines in New Caledonia in high-class ore and the Turkish and Russian mines in the low-class; but owing to their distance the Canadian mine owners have always been able to undersell them. If the progress of the past four years keeps up there is no reason to doubt that Canada will be able to dictate the price of chrome in the markets of the world.

THE GYPSUM mined in the United States in 1906 amounted to 1,540,585 short tons, valued at \$1,147,129. This production represents an increase in quantity of more than 47%, and in value of nearly 40%, as compared with that of 1905. This largely increased production, which surpasses by far that of any previous year, is accounted for partly by the rapid increase in new producers, the total number of whom at the close of 1906 amounted to 74, as against 46 in 1905, a gain of 61%. Since few of these, however, operated the whole year, they cannot be credited with a proportionate share of the increase in production. As to relative rank among the States producing gypsum, Michigan still holds first place. New York regains second place, with Iowa a close third. The remaining States show few changes in relative position since 1905, their present rank being as follows: Texas, Ohio, Oklahoma, Kansas, California, Wyoming, Virginia, Nevada, Oregon, Utah, New Mexico, Colorado, South Dakota, Alaska, Montana.

FELDSPAR may be altered through infiltrating waters carrying more or less carbonic acid in solution; also through the action of waters rendered acid by the decomposition of sulphides; or by ordinary waters holding traces of alkaline and other ingredients in solution. The presence of iron sulphide or a mineral containing iron protoxide, as some mica, garnet, etc., is often the first occasion of the change. The decomposition of the mineral, with the attendant oxidation of the iron, distributes ferruginous waters through the rock, and thus, by a decomposing action, prepares the way for other agencies. When the infiltrating waters contain traces of carbon dioxide, the feldspar acted on first loses its lime, if a lime feldspar, by a combination of the lime with this acid; next, its alkalies are carried off as carbonates, if the supply of carbonic acid continues, or otherwise as silicates in solution. The change thus going on, ends in forming kaolin or some other aluminous silicate. The carbonate of sodium or potassium, or the silicate of these bases, may go to the formation of other minerals, and may supply fresh and marine waters with their saline ingredients.

passes directly to a series of tables covered with cocoa-matting and expanded metal. The tailing from these tables goes directly to waste and the product cleaned up is washed down a launder to a settling-tank, shown about the lower half of the photograph. All the sand and coarser material that passes through the $\frac{1}{4}$ -in. screen is taken directly to a second series of screens having circular holes $\frac{3}{16}$ in. diam., the oversize from which passes to another series of tables as before. The fine material going through is then passed through two sets of tables placed in tandem, and at a less grade than those for handling the coarser material. These are also provided with cocoa-matting and expanded metal.

At the commencement of operations, these tables were only cleaned up about once every 24 hours, but subsequent experience proved that to do so more frequently was advisable, and they were eventually cleaned up every 2½ hours. The entire product resulting from these various clean-ups was passed by launders to settling-tanks, and as these became overcharged, the water was run off,

allowed to go to waste, we must certainly give Sanders & Hadly and Mr. Harvey credit for furnishing such a useful example to other hydraulic miners.

The criticisms which I have to offer and the suggestions which I would like to make are as follows: First, owing to the natural topography of the country at Mr. Harvey's mine, they were fortunate in obtaining a convenient site for the plant with almost unlimited grade for the dump, and water for power and other purposes, and it must be remembered that at every mine such facilities are not to be found.

Secondly, that while I think that they had the right idea when they attempted to size the product, it appears to me that they should have gone a step further and made the classification more complete and thorough. The cocoa-matting tables could then have been eliminated and the whole of the fine product less than $\frac{1}{4}$ in. could have been treated by the table concentrators, or it could have been first passed to hydraulic classifiers, using clean water, the coarse product being sent to table concentrators

and the fine to belt machines or canvas tables. The details of arrangement for different mines would have to be modified by experiment, to prove the proportions of valuable materials in the fine or medium-fine products. I think also that the table area with which they attempted to concentrate the product from the cocoa-matting, was inadequate for the task, and too crude and elementary in design.

An attempt was made with a shaking amalgamating table but it was abandoned, as it was found that a great part of the heavy grains of gold were so coated that they refused to amalgamate, that the table was to a great extent choked by a sheet of black sand, and that there was a considerable percentage of tin, copper, and



Upper Length of Sluice Boxes. Showing Step-Fault in Bed-Rock.

and the material dug out and stacked on the side. This material might be described as semi-concentrated, and here is where I see the greatest fault in the design of the plant. There appears to be a lack of continuity in the sizing process and also in the general plan of treatment. The whole of the material saved from these settling-tanks was passed over one single home-made concentrating table, the middling from which was re-concentrated and the fine run to waste.

The product from the concentrating table consisted principally of black sand. This was stacked in a settling-tank and dried from time to time on flat trays, the trays being placed over a roughly-built furnace. The dry product was then passed through a home-made magnetic separator, which appeared to work efficiently and satisfactorily. This removed practically all the magnetic iron, or more correctly speaking, the magnetizable iron sand, which has been stacked in a tailing-dump immediately below the shed, and, judging from a rough estimate I made, there is over 100 tons of this product. The rest of the material which was delivered by the moving canvas belt consisted of the usual by-products as shown by Dr. Day's experiments, and I am told that some of this material ran as high as \$1,000 per ton. When we consider that this product, which can be shipped and easily treated, has been concentrated down from sands and clays which were originally considered as tailing and

other base metals which entirely ruined the surface of the table. It therefore appears to me that if amalgamation is to be introduced for the purpose of saving gold in any part of a general process in which concentration enters, it should be applied in three separate and distinct methods, all subsequent to concentration:

1. If the gold is coarse and heavy enough to be caught by concentration, this is a more economical and rapid process than amalgamation. If the gold is so light and flaky that it readily passes over the surface and is not caught by the riffles, it is self-evident that it will be easier to amalgamate the light gold by some independent amalgamating device after the heavy concentrate has been removed. I would therefore insert an amalgamating device to treat the tailing of the concentrator, in preference to treating the pulp before concentration.

2. The coarse particles of gangue and other middling commonly to be found in the tailing of a concentrator, generally carry some fine gold actually imbedded, and as a general rule this fine gold is free and is not associated with base metals. While its weight, when associated with the enclosing gangue, is not sufficient to cause it to be caught by concentration, its weight, when liberated by regrinding these particles of gangue, is sufficient to enable it to be caught in any good amalgamating device, and as a rule the gold liberated by regrinding will freely amalgamate and cause no further trouble with the copper

and was considered first-class in every respect. The average hydraulic miner would certainly have stated that, if any gold was being lost, it was of such a nature that it could not be saved at all.

The successful working of the black sand plant eventually installed has shown the matter up in a different light. This description covers the most important points of interest with regard to the equipment of the mine.

The actual operation of mining is carried on much as usual, with the difference that Mr. Harvey makes the rather exceptional practice of mining 'left and right' of the nozzle and keeps a sloping nose of gravel immediately in front of the giant, thus being able to keep the giant right up to within 60 ft. of the high bank, without undue risk of a cave in front of the work. This method also allows an efficient side-cutting action to be used with the stream when undercutting.

Before giving a description of the black sand plant, I think that a few remarks on the subject may tend to give a clearer understanding of the problems to be faced, as much prominence has recently been given to the black sand question, on the one hand by careful scientific work by capable and reliable men, such as Dr. Day, and on the other hand by a lot of cheap newspaper rhetoric, written by men who have no real knowledge of the subject, and which has aroused adverse, and no doubt in some cases, just criticism.

First and foremost, the general argument put forth by all old-time miners is that, if you do not catch any gold in the tail end of your sluice-boxes or in your undercurrents, you are not likely to catch it by any other means that you may devise. This has always seemed to me to be an argument representative of ignorance and prejudice. Gold of all sizes and in particles of nearly every conceivable shape is found disseminated through the gravels of a placer mine. In some cases it is almost perfectly pure, has a clean surface, and will readily amalgamate. In other cases, it is so coated and foul that you may shake it in a bottle of amalgam and again separate it almost untouched. Some of the gold is flat and flaky, and if caught on its edge will travel for a considerable distance in a swiftly flowing current of water before getting a chance to settle, and I have noticed, in actual hydraulic mining and in experiments which I purposely carried out to determine the question that gold is transported for greater distances before settling, if the water is foul and muddy, than if the water is clean. I made the experiments by taking a known amount of fine gold grains and throwing them into sluice-boxes carrying both clean and muddy water, making a clean-up a few minutes afterward. Using foul water, heavily charged with clay, I found that in nearly every case a considerable amount of the fine gold was carried away, although in some of the tests this gold had been caught in the same sluice-boxes, using the same riffles and grade.

It appears to me that the research work which Dr. Day has carried on is not really of much value to the average hydraulic miner. Dr. Day merely carried out a series of thorough tests to see if certain samples of black sands submitted to him carried valuable metals, and principally to find out if they carried any platinum. I think it is generally accepted that black sands are nearly always associated with gold, though I could show anybody who wished to see it, great quantities of black sand which can be panned out from streams, in which I have never been able to find the slightest trace of gold, even by an assay. The gold, platinum, and black sands are commonly associated with each other merely by virtue of their specific gravity, and I do not think that any experiments or tests have so far proved or even pretended to prove that the gold is in direct combination with the

black sand, but have merely gone to show that if you wish to save the fine particles of gold and platinum it is necessary to save all the associated minerals having a high specific gravity, and subsequently to separate the gold and platinum from the less valuable iron grains.

Dr. Day's work has been mostly along this line, but what the hydraulic miner chiefly requires to know is, not so much how to separate the valuable materials from the black sand (that being an after consideration and within the province of a metallurgist) as to know how to save the black sand itself with its associated gold and platinum, and separate the same from the enormous bulk of sand, clay, and gravel.

The hydraulic miner's pan and sluice-box are, after all, nothing more nor less than a crude wet-concentrating device, in which no attempt has been made at classification before concentration. It is the experience in nearly all concentration plants that have been erected for the successful treatment of pulp from mills, that the question of sizing is an important one, and that if the grains or particles vary by even 3 or 4 diameters it will lessen the efficiency of the concentration. How much more then must we expect this effect where quartz boulders 12 inches in diameter are bumped through a sluice-box in a stream of water having a velocity of 15 ft. per second or more, and attempt, at the same time, to throw down and catch a grain of gold which can be passed through a 100-mesh screen. Furthermore, the miner's sluice-box is a concentrator in which the products accumulate and are only removed at stated intervals, that is to say, the process is not continuous, and the black sand (which in some cases amounts to 30 or 40 lb. per cu. yd.) has a tendency to rapidly cover the surface of the quicksilver in the riffles, to choke the bed of the riffles, and allow the fine gold to be washed over them, and in consequence, to run to waste.

At the beginning of last season's run, Sanders & Hadly in conjunction with Mr. Harvey, designed a plant for experimental purposes, which has been so successful as to pay for itself and leave a considerable net profit. Sanders & Hadly certainly deserve credit for the plucky way in which they have handled this problem, and the plant, although lacking in some details, has undoubtedly solved some of the most vexing questions of the problem. The accompanying photograph will give some idea of the general arrangement of the plant. Near the lower end of the main sluice-box, an undercurrent was inserted, having a grizzly built up in four sections, the first of which was a $\frac{3}{8}$ -in. stamped steel plate, the second consisting of bars placed $\frac{1}{2}$ in. apart, and the third and fourth consisting of grizzlies having $\frac{1}{2}$ -in. slots and V-shaped bars. All of the fine product from the gravel does not pass through this grizzly, but the amount to be handled approximates, as nearly as we could estimate, 2,000 cu. yd. of material, varying from flat pieces of slate $\frac{1}{4}$ in. thick and 1 in. long, down to the finest mud. This would represent from 3,000 to 4,000 tons of material to be treated per 24 hours, and considering the low value of the product, probably not more than a few cents per cubic yard, it requires some careful and ingenious planning to handle this material at a low figure and without an undue initial expenditure, and this is the largest plant of its kind in existence for the successful concentration of low-grade material on a large scale.

The product as received from the undercurrent grizzly is transported in a flume to a distributing box placed at right angles to the flume, and which forms the head of the whole plant. This distributing box serves to regulate the flow of sand to a number of different sieves, consisting of flat steel plates punched with round holes. The first lot are punched with $\frac{1}{4}$ -in. holes, and the over-size

The Hydraulic Equipment of the Old Channel Mines.

Written for the MINING AND SCIENTIFIC PRESS
By JOHN M. NICOL.

The Old Channel mines were first discovered in 1865. This enormous deposit of auriferous gravel may be traced for about 15 miles, having a general north and south direction.

The bedrock consists of black shale and reddish colored mica schist. The schist is much contorted and the stratification is on edge. The level of bedrock averages about 500 ft. above the Rogue river, with an elevation of about 1,100 ft. above sea-level, so that the mines have magnificent facilities for dumping the tailing.

The gravel banks vary from 50 up to 250 ft. in thickness, and are from 200 to 600 yd. wide. The gravel is fairly even, and although in some places a few coarse pebbles and large boulders have been found, nearly all of the material can be put through the sluice-boxes.

There are seven large gulches that cut through the formation at right angles, and it was in these gulches that gold was first discovered, and the early work of placer mining carried on. The gulches have been excavated clear through the gravel and through the slate bedrock, and offer a number of different points at which to commence mining and in which to dump the tailing.

A good idea can be formed of the size and depth to which these gulches have been excavated by the action of running water, on referring to the photograph showing the dump at the end of the sluice-box, and which gives a good idea of the age of the deposit.

These mines have been worked continuously for 30 years, and are at present owned by the Old Channel Mining Co., and leased by John R. Harvey, of Grants Pass, Oregon. Mr. Harvey has been working the mines on a large scale for the last three years, and some information regarding his plant and the methods of working may be of interest.

The present plant consists of a ditch 12 miles long, measuring $8\frac{1}{2}$ ft. wide on top, 5 ft. wide on the bottom, and with a minimum depth of $3\frac{1}{2}$ ft., and a grade of half an inch per rod. The water is taken from Galice and Mill creeks, and the average flow for nine months in the year is from 4,000 to 5,000 miner's inches. There is also an extra flume, which brings in the water from Rocky gulch, and during the early winter rains, and while the snows are melting, this gives an additional flow of 1,500 miner's inches, enough to run one giant.

The ditch delivers to a small reservoir, and this in turn empties into a lower reservoir, from which the water is taken by means of two pressure-boxes and delivered to two separate pipe-lines. The value of the additional water supply from Rocky gulch, and the reserve of water in the two reservoirs can scarcely be exaggerated, for it will often happen during dry spells that the main ditch does not supply sufficient water to run all three giants and maintain the pipes full, in which case trouble would probably result, whereas the slight additional amount is sufficient to tide over the shortage of the main supply during the dry season.

The main pipe-line is 24 in. diam., and has an intake of 48 in. diam., and a total length of 2,600 ft. This supplies water under a head of 510 ft. to three No. 4 Hendy giants, using 6-in. nozzles.

Mr. Harvey informs me that when work is running full blast, they are able to break down and put through the sluice-boxes from 6,000 to 7,000 cu. yd. of gravel per 24 hours, and the average cost of working the gravel from grass roots to bedrock, allowing for expenditures of all kinds for a season's run, does not exceed 3c. per cu. yd.,

and averages $2\frac{1}{2}$ c. I am also informed by Mr. Harvey that the company owns about 900 acres of patented land in heavy gravel and about the same amount in minor claims, and as they own the most valuable water-rights available in the neighborhood, it may be roughly stated that their holdings cover the facilities for working between 3,000 and 4,000 acres in this neighborhood, which probably could not be worked by any other means, as pumping from the Rogue river to the height necessary to supply water under pressure for mining these gravels would be a serious undertaking and one involving a large outlay of capital.

Until about 15 months ago the methods in use for saving the gold were identical with those used on hydraulic



Old Channel Mine, Showing Grade and Dump Available.

mines from the earliest times, and consisted of a bedrock race which discharged into a sluice-box 5 ft. wide, 3 ft. deep, and having a total length of 1,200 ft. The first 90 ft. had a grade of eight inches in 12 ft., and the remainder a grade of seven inches in 12 ft. This sluice-box, in turn, discharged into a bedrock race.

There is a drop of 10 ft. at the end of the sluice-box that serves to break up any blocks of cemented gravel and to more effectually wash and free the material. After passing through 120 ft. of race, the gravel goes into a second line of sluices, having an average grade of twelve inches in 12 ft., a width of 5 ft., and a depth of 3 ft. The gold-saving device consisted of block riffles, 10 in. thick and spaced about $3\frac{1}{2}$ in. Quicksilver was used and clean-ups were made at the usual intervals. This arrangement was up to the usual standard of efficiency,

plates. I therefore recommend that the tailing from the concentrating tables be separated by hydraulic classifiers and the coarse particles, which make a small bulk, may then be conveniently reground and passed to some amalgamating device.

3. The concentrate may be treated by pan-amalgamation after the removal of the black sand by means of magnetic separators, provided there is not an excessive quantity of platinum or other valuable by-products, which may preferably be removed by other means.

The above are merely suggestions, based upon the results of observation and experiment, and by such means we should be enabled to make a positive saving by amalgamation, that could not be carried on as economically, simply, or efficiently by other means. I am referring more especially to the treatment of the products of a placer mine.

As I am following up this question of saving gold from hydraulic mining operations, I hope soon to be able to present some further data relative to this subject, and I shall be glad to receive criticisms on the foregoing observations, and to hear of the results and experiments of other men in the same field.

PRODUCTION OF QUICKSILVER.—The principal foreign quicksilver producing countries are Spain, Austria, Italy, Russia, and Mexico. Together with the United States, they practically supply the quicksilver markets of the world. In Spain the output of the famous Almaden mines is supplemented by the product of smaller deposits in the provinces of Almeria, Granada, and Oviedo. This country was for many years the leading producer, but in 1904 it was outranked by the United States. Most of the Spanish quicksilver is exported to London. The Idria mines in Austria are steady producers and make an annual output of from 510 to 550 metric tons. In Italy the annual production of the quicksilver mines of Tuscany varies from 300 to 375 metric tons. The most important mine is the Siele, near Castell, Azzara. There has been considerable activity in the district, and new mines have been opened at Badia, San Salvador, and Montebruno. All indications point to a steady, if not an increased, production from this province. The Russian output of quicksilver comes from the mines of A. Auerbach & Co., in the Ekaterinoslav district. These mines have produced 400 tons per year of the metal, most of which was exported to Hamburg, Germany. In Mexico the principal deposits of quicksilver ore are at Huizuco, in the State of Guerrero, and at Guadalcázar, in San Luis Potosí. There are also very promising deposits in Querétaro and Guanajuato; and the States of Morelos, Jalisco, Mexico, Hidalgo, Zacatecas, and Chihuahua also possess numerous smaller deposits. Small quantities of quicksilver are annually produced in the mines of Huancavelica, Peru; in the Wang Shan Chang mines of Kweichow, China; and from the Taghit mines in Algeria. Quicksilver occurs also in British Columbia, Japan, Germany, Turkey, and New South Wales.

URUGUAY MINES.—The principal source of Uruguay's wealth is live stock, but the country is said to be rich in minerals. So far this source of wealth has been almost entirely neglected. With the exception of granite quarries in various parts of the country and four gold mines at Cufiapirú, in the department of Rivera, the mineral deposits have not been worked. In the past year, however, great interest has been manifested by mining men in the possibilities of various goldfields, supposed to be rich in high-grade ore. Several mining engineers and prospectors from South Africa and elsewhere have reported on the prospects.

Uses of Antimony.

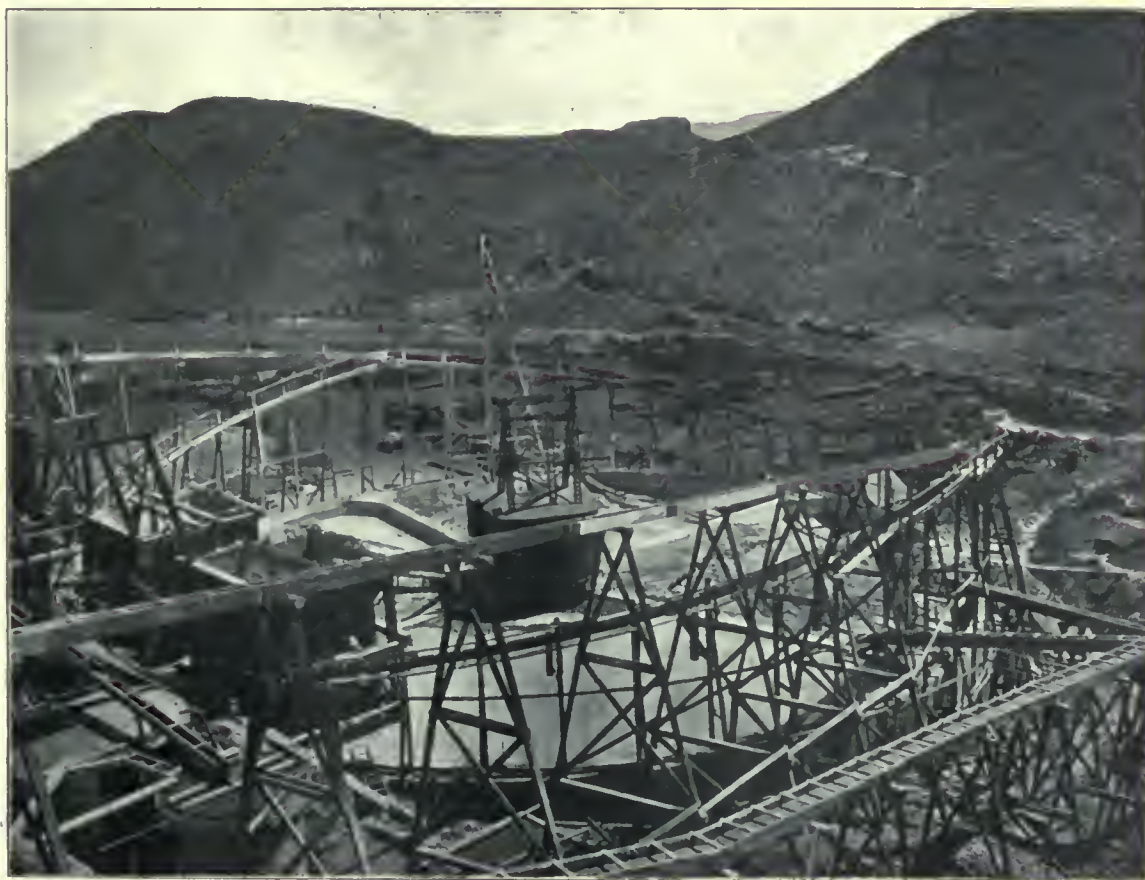
Undoubtedly the chief use of antimony is for alloying with other metals for the purpose of making a lustrous hard mixture. Type metal contains from 17 to 20% antimony, in addition to lead and bismuth. Britannia metal is an alloy of 10% antimony, and 90% tin. Pewter contains 7.1% antimony, 1.8% copper, 1.8% bismuth, and 89.3% tin, and is employed for certain tableware. Aluminum-antimony alloys are being made; they are hard, tenacious, elastic, malleable, take a high polish, and resist atmospheric corrosion. Nickel, copper, silver, tungsten, and other metals will readily combine with aluminum and antimony, these alloys being used for special castings. Lead when alloyed with antimony and metallic sodium has unique non-corrosive properties, is strong, and rolls better into sheets and wire. This alloy may be soldered by the ordinary soldering iron with the use of the blowpipe. This alloy has been made as follows: The antimony is melted in a crucible, and the lead added; the metallic sodium is next introduced, and the whole is then stirred energetically. The mixture, containing 1,000 lb. lead, 15 lb. antimony, and 1 lb. sodium, is then cast into molds. Zinc readily unites with antimony in all proportions, forming alloys which are brittle and fusible. When alloyed in equal parts, antimony and zinc are of a bright sky-blue color, and have the peculiar property of writing on glass. Antimony-zinc alloys are employed in a small way in thermopiles. The various patented antifriction metals used for high-speed machinery contain antimony. The attention of inventors seems to be devoted mostly to the discovery of an improved economic method of recovering antimony from its various ores, and of refining the metal to a high tenor of purity. The preparation of alloys offers a field for profitable research, and among the minor specialties is antimonial plating. According to one patentee, antimony compounds may be recovered from pulverized ore (especially stibnite), by treating in a heated solution of 2% caustic soda. The process proceeds in a cycle, the alkaline solution first acting on the ore, then being formed into a carbonate, and then becoming re-causticised repeatedly. By another method antimony oxide is prepared from stibnite by treating the pulverized ore with sulphuric acid in the presence of sodium or potassium sulphates, and after allowing the substance to cool, boiling it with water until it is decomposed. Antimony oxide is left, and the acid released is used over again. Another patent electrolyzes antimony trifluoride in a cell having the impure antimony as anode. A process for coating metallic articles with antimony by immersing them in antimony powder, and heating the mass, has also been patented.

THE centre of the Georgia marble industry is Tate, about 50 miles north of Atlanta, in Pickens county, on the main line of the L. & N. railway. Tate lies among the hills, in a little valley formed by one of the sources of the Etowah river. The whole valley, and several of the enclosing hills, are practically solid marble, ranging in color from pure white to dark Creole, with many variations of shade between. The deposits have not been exploited for more than 175 ft. below the ground, owing to their large surface area. The marble is popular for building uses in all parts of the country. Its low absorption of moisture, about six one-hundredths of one per cent, renders it practically impervious to weathering in any climate. In this particular, microscopic tests have shown that this stone resembles closely the marbles of Greece. Georgia marble shows a crushing strength of 12,000 to 15,000 lb. per square inch.

A Concrete Tank to Store Tailing.

This large concrete tank is for the purpose of retaining the tailing of the No. 6 concentrator of the Arizona Copper Co. It is circular in shape and divided into four equal compartments. In the centre is a three-movement cantilever crane (built by the McMyler Mfg. Co., of Cleveland, Ohio), controlled from the base in a revolving motor-room, and operating a large double-jawed bucket suspended from the upper end by $\frac{7}{8}$ -in. cable. The entire outer edge of the tank is followed by a fixed launder, while a movable launder, working on rails, covers the inside, and may be moved to connect at any point to the fixed launder, thereby making it possible to throw the tailing to any desired spot. Under the tank, sunken launders, with screens, enable the clear water to be drawn free of tailing, run into other tanks, and pumped

THE DEVIL'S TOWER QUADRANGLE.—This quadrangle includes about 850 square miles in the northeastern part of Crook county, Wyo., its northern limit being the Montana-Wyoming State line. Its southeastern two-thirds lies in the northern extension of the Black Hills uplift, and its northwestern portion extends into the Great Plains, so that its topography exhibits features of both regions. Elevations within the quadrangle range from 3,500 ft. above sea-level in the plains region to 5,800 ft. at the highest point of the Black Hills area. The quadrangle includes portions of the valleys of Belle Fourche and Little Missouri rivers, the Little Missouri heading within it. The most notable feature of the region, and one of the most conspicuous topographic forms in the entire Black Hills area, is the mass of igneous rock from which it is named—the Devil's Tower—which stands on one of the ridges west of the Belle Fourche. About 100



Concrete Tank to Store Tailing.

by two 3-plunger pumps (made by the Deming Co. of Salem, Ohio), driven by two 10-h.p. direct-connected (National Electric Co., Milwaukee, Wis.), high-speed motors, back to the tanks above the concentrator for use over again. The compartment containing the dry tailing is being emptied by the crane, taking the tailing and putting it into two bins at the bottom of a 15-ft. gravity incline, by which it is then hauled to a large bin at the top of the mill, from where it is carried by Humphrey electric motors to the Longfellow, Humboldt, Clay, and other mines of this company to be used as filling. This method of disposing of the tailing problem has proved a decided success, and as a result, the litigation started by the farmers of the Gila valley has been stopped, they having claimed heretofore that the tailing in the irrigating water from the river was ruining their land. The idea of this tank was conceived and carried out by C. D. Clark, who built the No. 5 concentrator for the Arizona Copper Co., and who is the representative of a London company at Mandalay, in Burma.

ft. in diam. at the top, almost circular in form, and with sides nearly vertical, it rises 600 ft. above the sandstone platform that forms its base and a little less than 1,250 ft. above the river, which runs a short distance to the east.

IRON IN TALLADEGA COUNTY, ALABAMA.—The gray iron ores of Alabama occur in a belt that is confined almost entirely to Talladega county, and although this belt of ore has long been known, but little attention has been paid to it as a source of iron. The only company now in active operation in this region is taking out ore at but one locality—the Mesaba or Tallaseehatchee mine, on Tallaseehatchee creek. Practically all the so-called gray ore is hematite, but in places the percentage of magnetite is so large that the ore is somewhat magnetic. Its name, derived from the ashy gray color which it takes on weathering, not only describes it but serves to distinguish it from the brown or red ores of the northern part of the State.

Keeping Account of Supplies.—II.

Written for the MINING AND SCIENTIFIC PRESS
By MATT. W. ALDERSON.

The importance of a system that will prevent any possible leaks from illegitimate causes around the mine should be apparent to every prudent manager. Even though it does cost a little time and money, it will save money in the end. And the system I outline will actually require less time and attention than some in use that do not accomplish good results. Thus, at most mines candles are issued every morning to the men as they go to work. My practice is to issue to them once a week only. Each man as he goes to work Monday morning receives 15 candles—more than he will need, but enough to provide a reserve for any unforeseen emergency. If he is working in a part of the mine where it will be advantageous for him to have his own powder-thawer, he is furnished with one, and with 36 sticks of dynamite, 100 ft. of fuse, and a box of caps.

Where several men work in one place, as where two or more shifts of two men each are making a drift or where several men are working in one stope, I issue to the group, designating one man to receive the supplies and report. The amount used each week is then divided by the number of men, to find the average for each man. Saturday night, as each man comes out of the mine, he stops at a desk in the shaft-house and fills out a ticket as follows:

SUPPLIES ON HAND.

Saturday eve1907

.....candles

.....sticks dynamite

.....feet fuse

.....caps

.....Name

If he receives only candles, he fills in for that one item. No entry is made on the lines for 'feet fuse' and 'caps' until these are down to where the miner has not enough to last him the coming week. Each man hangs his ticket on a wire and departs. The foreman (or storekeeper) takes the tickets, makes entry in a book kept for the purpose of recording supplies used, and lays out what is needed for each man, so that he starts with the same amount on the second and succeeding weeks.

Monday morning, as the miner goes to work, he finds on a shelf arranged for the purpose, a sack similar to those used by school children for carrying their books, in which are his dynamite and candles, the latter wrapped in a newspaper. I have used ore-sacks and at other times the lower halves of burlap grain-sacks to hold these supplies. If caps are wanted, they are laid on the top of the sack so that the man can pick them up and put them in his pocket. The sack is tagged and if there are many employees, the sacks are arranged in rough alphabetical order, so that each man can quickly find his own.

This arrangement involves fixing a place near where each man works, in which he can keep his supplies. If there are rats in the mine, the candles and dynamite must be kept under cover. I use a candle-box, an ordinary fruit-box, or a dynamite-box, make a partition in it so that candles may be kept on one side and dynamite on the other, and put on a lid. The caps and fuse can be kept in a nook by themselves and will not be molested. Rats nibble at fuse sometimes, but seldom enough to injure it.

Where several men have access to the same dynamite-

thawer in the mine, I charge the thawer with the supplies that go to it from the storehouse. On a board near the thawer is a sheet whereon each man enters the number of sticks he takes, a pencil for making the entries being conveniently suspended by a fine chain. These sheets are gathered each Saturday night and new ones put in their places. The person taking them up notes on the sheet the amount of dynamite in the thawer, so that the foreman has a check on the figures put down by his men.

RECORD OF DYNAMITE USED ON THE FIRST LEVEL OF
THE SNOWDRIFT MINE
FOR THE WEEK ENDING JULY 20, 1907.

Name of Miner.	Mon.		Tues.		Wed.		Thurs.		Fri.		Sat.		Total
	a	d	a	d	a	d	a	d	a	d	a	d	
	u	m	u	m	u	m	u	m	u	m	u	m	
Geo. White.....	3	2	4	2	2½	3½	1	4	1	3	1½	3	30.5
Herman Dahl	1	1	1	2½	.....	4	.....	3½	4	1½	2	2	22.5
John Smythe	2½	1½	2	1½	2	3	2½	1	2½	1	2	2	23.5
Thos. Fox	.....	3	.....	4	.....	7	.....	3½	.....	4½	.....	5	27.0
Totals	6½	7½	7	10	4½	17½	3½	12	7½	10	5½	12	103.5

In thawer, 87.5 sticks.

When the results are tabulated, on the last Saturday of each month, it is a good idea to make copies to place on the bulletin board. Separate tables should be made for men that are working under different conditions, as where one uses his snuffs to warm the water of his powder-thawer and another does not; and where one is breaking ore and another driving in barren ground. The tables will show the men that the manager is attending strictly to business and knows exactly what is going on, and that the men are judged not alone by the amount of powder they use, but by what is accomplished with it. These reports will be an inspiration to the best men and should encourage those behind to make a better record. My idea is not to skimp the men, but to get them to use their intelligence and to practise reasonable economy. Many a man who goes after powder, who would take 30 sticks for a round of holes made with a machine, might think 25 would do nicely if he knew the boss was keeping account of just what he used every day. It may be more economical to use sufficient powder to break ground fine than to 'bulldoze' masses left by breaking with too small a charge. The manager is not parsimonious when he adopts vigorous measures to eliminate waste. The candle snuffs with which the miner starts his fires in the winter are not justly chargeable to the expense account of the mine, and the stick of powder that the miner uses for tamping, after the hole has been loaded with sufficient explosive, is just so much hard-earned money thrown away.

ALTHOUGH diamonds have been found in at least thirty places in the United States, the only locality where they occur in place has recently been discovered and has been investigated by George F. Kunz, the gem expert, and H. S. Washington, petrographer. They occur in an igneous rock, similar to that of the South African mines, which forms a small stock near Murfreesboro, Pike county, Ark. The first two stones were found August 1, 1906, and since then many of them have been picked up, the total number found at last report being 130. Many are white and of good water, others are yellow, and some are of brown bort. The two largest stones weigh 6¼ carats, one being exceedingly fine white and the other brown. They are found on the surface as well as within the greenish, friable, decomposed peridotite, a rock somewhat like the famous 'blue ground' of Kimberley. The property is being actively prospected and developed.—*Science.*

be inserted. Derricks had to be erected, and electric wires strung for lighting the workmen on night shift. Fortunately, there was a railroad track across the flue

The ore treated in the Washoe plant comes chiefly from Butte, which is 28 miles from Anaconda. Most of the ore undergoes concentration. The fine concentrate



Fig. 2. Main Flue, June 4, 1907.



Fig. 3. Repairing the Big Flue.

where the cave-in occurred, so that transportation facilities were afforded.
The workmen had to be organized into three shifts of eight hours each, and means taken to provide them with hot meals during the progress of the work.

is briquetted. Roasting is done in an Evans-Klepetko modification of the McDougall furnace. Smelting is effected in blast-furnaces of immense size designed by Mathewson. One of these is 87 ft. long. The operation of the plant is conducted most efficiently.

Manufactured Graphite.

One of the most important electrical industries at Niagara Falls manufactures graphite from anthracite coal and petroleum coke and converts into graphite the forms of raw carbon used in electric furnace work, where high temperature is required, and for electrolytic work, such as the manufacture of caustic sodas, bleaching powders, etc.—in fact, practically all methods of electrolysis. The raw materials used consist of anthracite coal, glass sand, foundry coke, and sawdust, all of which are imported from the United States, except the sawdust. The furnaces used for the conversion of the anthracite coal or petroleum coke into graphite are in the form of long narrow troughs, built of fire-brick and lined with some suitable refractory or insulating material. In this case the sand, coke, and sawdust are used for insulating, by mixing them together in the proper proportions. At the end of each trough is a terminal built of carbon rods, to which is connected the cables conveying the current. The trough is filled with anthracite coal, in which is embedded a carbon rod to make electrical connection between the terminals, as the coal is a very poor conductor of electricity. The temperature to which the coal is raised before conversion into graphite is very high, and is said to approximate 7,500° F., a temperature at which all bodies except carbon are vaporized and driven off. It is possible to make the graphite practically chemically pure, but for ordinary commercial purposes such a high degree of purity is unnecessary, but it is possible to so regulate the operation that a degree of uniformity of purity is attained which is not possible to secure in the production of natural graphites. When the furnace has cooled sufficiently the graphite is removed, but it is not yet in commercial form and has to be ground to powder and finally separated into the sizes necessary for the various uses to which graphite is put, one of the most important of which is its application as a protective coating for iron and other metal structures. During 1906, 454,311 lb. of graphite were manufactured here, the greater part of which was exported to the United States. The demand in Canada, though steadily growing, has not warranted the construction of a complete grinding factory such as would be necessary to make all the forms and grades ordinarily required in the trade. In comparison with the production of graphite in this manner, the quantity mined in Canada is surprisingly small, the report for 1905 showing that only 541 short tons were mined, valued at \$17,032, while the value of artificial graphite for 1906 was \$21,579.

CHILEAN NITRATE.—The export of nitrate from Chile in 1906 of 17,279,651 metric quintals, of 220.46 lb. each, was valued at \$84,520,035. The cost of exploitation per Spanish quintal of 101.6 lb., delivered on board and including the government tax of 28 English pence per quintal, as given by the different countries, varies from P4.4 to P5.17. As the product is worth about P9 per quintal, this shows an average profit of nearly 50%. La Asociación Salitrera de Propaganda, which regulates the exportation and quota of each company, when arranging for the year ending March 31, 1907, authorized an exportation of 43,000,000 quintals.

Quick Repairs to a Smoke-Flue.

By the courtesy of Mr. E. P. Mathewson, general manager of the Washoe works of the Anaconda Copper Mining Co., we are able to give some interesting notes on the quick repairs done to the large smoke-flue of that important smelting establishment.

At 9 A. M. on June 4, 1907, 108 ft. of the roof of the dust-chamber, 60 ft. wide, or main smoke-flue, at the Washoe smelter, suddenly collapsed. The smoke from all the smelting operations passed through this flue; consequently, all smelting operations were stopped until 5 P. M. June 6, when the flue was repaired and work resumed.

The construction of the flue at this point is shown in Fig. 1. The columns are 12-in. I-beams, the stringers 15-in. I-beams supporting 7-in. I-beams that act as purlins extending from wall to wall. The 7-in. I-beams are

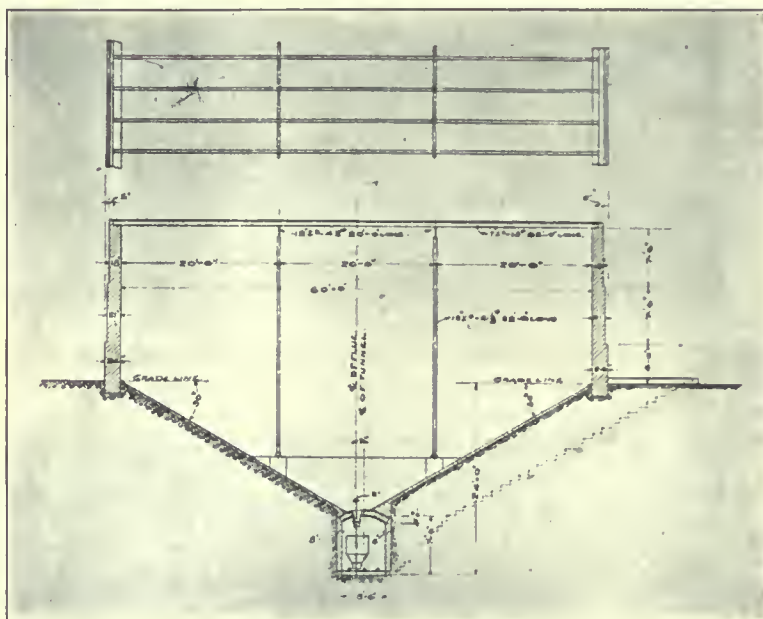


Fig. 1. Showing Construction of Flue.

spaced 42 in. centre to centre, and between them 4-in. brick arches are laid. The 15-in. stringers are bolted to the caps of the columns by eight $\frac{3}{4}$ -in. bolts, four at each end. The failure of the construction was due to the shearing of these last mentioned bolts by expansion.

In the repair construction, trusses were placed on brick pilasters, and from these the stringers and purlins were supported. Two of the trusses are shown in Fig. 2. The material is being prepared for the continuance of this style of construction, to replace the old form, as rapidly as possible.

Fig. 3 shows one-half of the opening caused by the cave-in of the flue.

To give an idea of the damage and the amount of work necessary to repair it, the following figures are quoted: An opening, 60 ft. wide and 108 ft. long, had to be covered; 216 ft. of 15-in. I-beams had to be punched with four $\frac{3}{4}$ -in. holes every 42 in. to receive 8-in. purlins, which were put in place of the 7 in. formerly used, and also punched eight holes for column connection, and 10 holes for splicing plates on each beam. Two 60-ft. trusses had to be made. The eleven 8-in. and twenty-one 10-in. I-beams were used in place of the 7-in. I-beams for the roof purlins. All these I-beams had to be spliced, as the material on hand was too short. Between the purlins, corrugated iron centres for a temporary covering, as well as for the brick arches, had to

ft. per min. with a clear shaft, but as much of the area would be taken up with cages, pumps, etc., the velocity would have to be greater than this. As another example, with 1,000 persons in the mine, 150 cu. ft. to each person, 150,000 cu. ft. per min. would be required; this amount would reduce the velocity to about 890 ft. per min., so that a shaft should not be less in area than this if required to pass a sufficient quantity of air for 1,000 persons to a depth of 2,000 ft. As another illustration, to pass 35,000 cu. ft. of air per min. through a shaft 8 by 4 ft., 1,100 ft. deep, would require 42 hp. and a pressure that would run the water gauge up to $4\frac{1}{2}$ in., which is too high for economical operation; this shows that the shaft is too small for the amount of air requisite to good ventilation, unless a mechanical device is used by means of which, as illustrated, the amount of air passed through

so as to give a sufficient supply to every working place in the mine.

An exhaust fan of 250,000 cu. ft. capacity is shown in Fig. 1, on the surface and connected with the vertical hoisting shaft; in order to gain a larger area, another air course is shown by dotted lines, from the 1,000-ft. level up through the vein. If this is made of large area it will materially assist the work of the fan, thereby reducing the power required for its operation. On the 1,000-ft. level is shown another fan of 120,000 cu. ft. capacity, the discharge being through an air course, at an inclination with the shaft, thus acting as a jet, and creating a suction to draw the air from the lower levels, at the same time assisting the surface fan.

It being generally understood that air becomes heated in traveling down from the mouth of the downcast

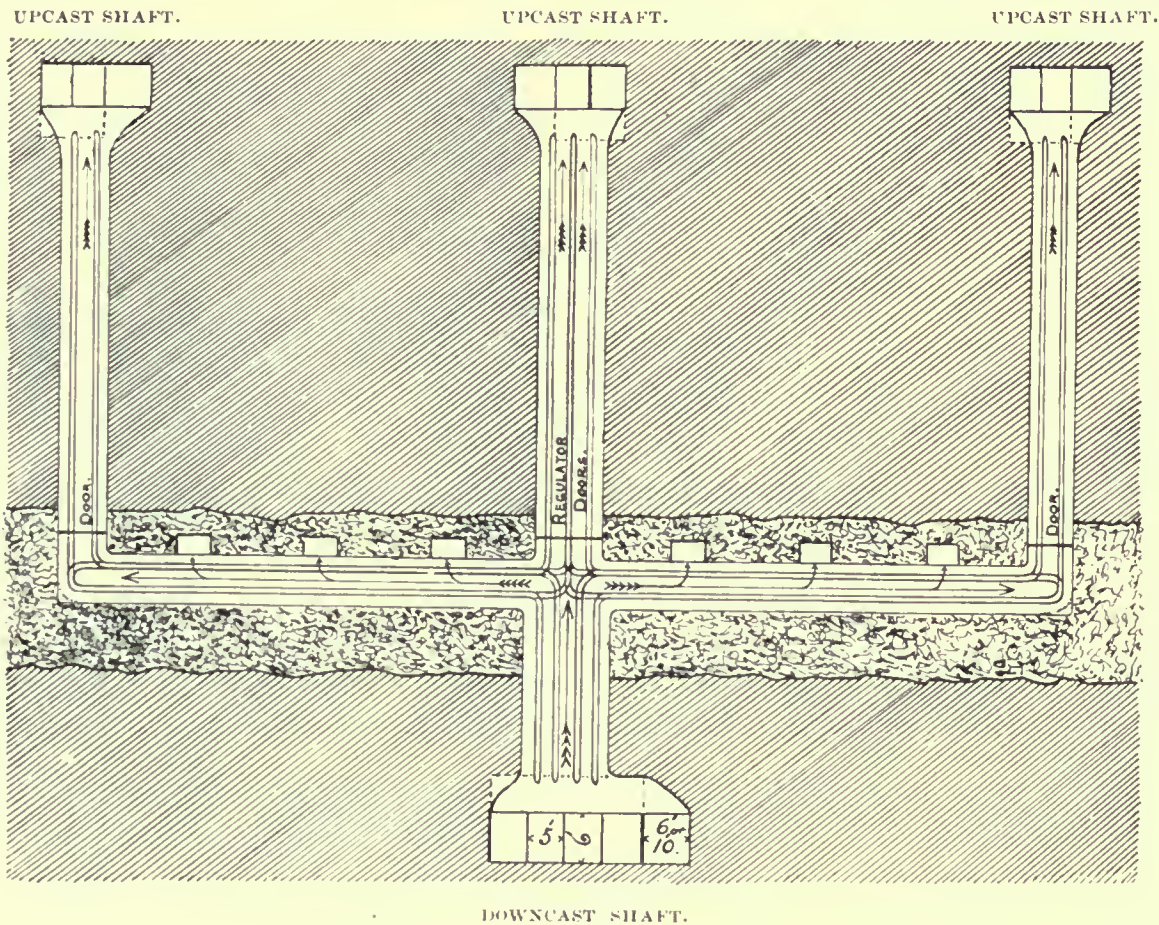


Fig. 2. Plan of 2,500-Ft. Level.

the shaft may be three times greater than is possible by a system of natural ventilation.

With the natural system of ventilation, to insure a sufficient supply of air shafts and airways must be made at least three times larger in area than may be used to advantage with mechanical ventilators; and it is an impossibility to thoroughly ventilate a group of mines as illustrated in Fig. 1 and 2, employing 1,000 men underground at the depths indicated, by natural ventilation, unless all the shafts and air courses are made three times the area, or the number trebled.

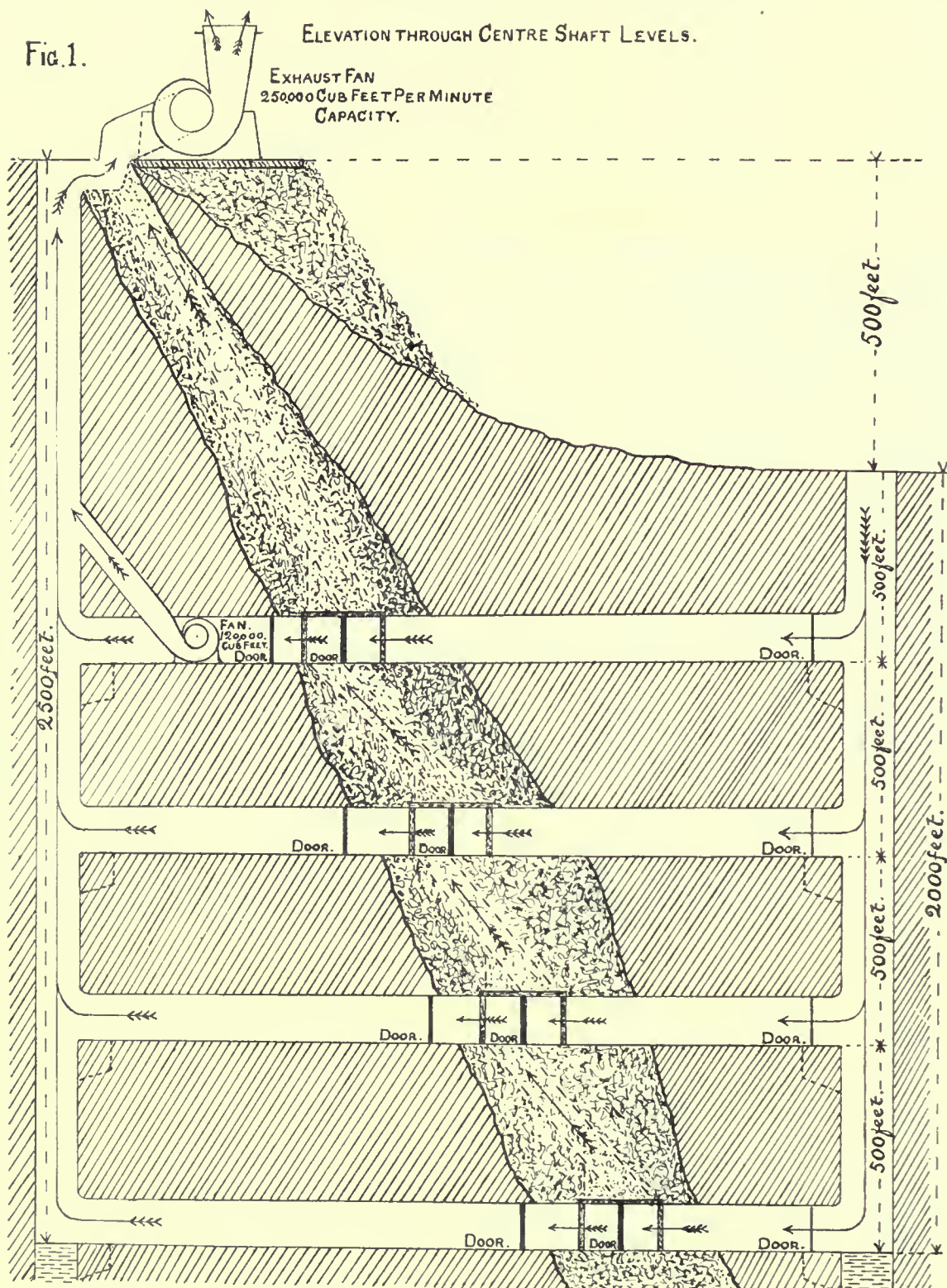
These illustrations are given to show how such mines may be ventilated by the vacuum system, with mechanical ventilators, adapted for supplying air in mines (especially quartz mines), with shafts and airways so small as to be inadequate to allow of proper ventilation by any other means, and this only may be accomplished by regulating the air currents by doors placed as shown, the course of the currents being indicated by the arrows; by the proper use of these doors the air may be distributed

shaft and through the air courses, and at the same time expands from this heat, probably 10% in volume; this expansion reduces its weight per cubic foot, and makes it lighter than the incoming air at a lower temperature, and naturally causes it to rise to the upcast shaft, but as the air courses and shaft are insufficient in area to allow it to pass, it becomes humid and heavy, thus stopping the circulation. As the air becomes heated and expanded while passing through the airways, a larger volume must be passed through the upcast shaft; but since, as already noted, the shaft is too small, it would be useless to force more air into the mine, as in the forcing system, for by that every crevice would be filled with foul air which could not escape.

With the vacuum system the operation is entirely different as the exhaust fan is placed at or near the top of the upcast shaft, a suction is created by which all the foul air and impurities are drawn out of every part at a high velocity through the courses designed for that especial purpose, forming a vacuum, which induces a

the hurry to extract ore, the mine is often soon brought into such a condition that the foul air filling workings renders it impossible for the employees to accomplish a normal amount of work; under these conditions, satisfactory results cannot be expected. From this it may be inferred that ventilation has a much greater effect on the cost of extraction than would at first be imagined; there is no doubt but that the cost is doubled in many

As the quantity of air required by the laws of several States is 100 cu. ft. per man per minute, and in some cases 200 ft. per min., an estimate may be made from the number of men employed underground as to what amount will be required. If, in the mines illustrated by Fig. 1 and 2, there are 1,500 men employed, at 100 cu. ft. per man, 150,000 cu. ft. would be required; when a large area has been worked out more air is required, probably



mines, through the failure of the managers to provide an adequate system of ventilation.

The quantity of air required in every case cannot be stated, as an amount that would be adequate for a given number of men in a new mine would be inadequate in an old mine, with many unfilled places that require a larger volume of air in circulation to carry off the smoke, poisonous gases, and dampness from the old workings.

150 cu. ft. per man, or 225,000 cu. ft. per min.; this is a large volume of air to keep in circulation, and shafts and air courses must be of such size that the mine resistance will not require too high a pressure to move it.

Referring to Fig. 2, it will be seen that the downcast shaft, with four compartments, each 6 by 5 ft. and one compartment 10 by 5 ft., has an area of 170 sq. ft.; to pass 225,000 cu. ft., this would mean a velocity of about 1,300

Economy in Mining Operations.

Written for the MINING AND SCIENTIFIC PRESS
By THOMAS E. LAMBERT.

The operation of mines and the first step in development present many problems of great interest. When a mining property is under the management of a thoroughly practical man, the question is solved in accord with local conditions, and is a financial success if the pay-ore lasts. Others, the same object in view, disregard the vital necessities by giving too much attention to the first cost, underestimating the advantages to be attained from an obligatory expenditure in early development work. The opposite extreme is presented by other managers, imbued with exalted ideas of superiority, who recklessly put all the earnings of the mine into expensive, premature, and unnecessary work. Good sense avoids extremes.

It is not intended here to speak of the location and preliminary development of mining claims, but after the property has come into possession of a corporation, the question of the best plan for future operations must be placed in the hands of thoroughly practical men, and on their judgment the success or failure of the venture depends.

In order that the following remarks may be better understood, reference is made to the accompanying drawings.

At the outset care must be taken in tracing the direction and pitch of the vein; supposing a case in which the claims owned by the company are three in number, of 1,500 ft. each, end-lining one another, and a vein 10 ft. wide is proved to run through all the claims nearly parallel with the side-lines. Shafts should be sunk at points best adapted for opening up the property, and for permanent use after development has proved the value of the ground; in this case, a shaft should be sunk at each end of the group of claims, not less than 50 ft. from the end-lines, and a third in a central position. All these shafts should follow the vein and be not less than 8 by 4 ft. in the clear, if possible, with two compartments, boarded up close in the centre, so as to cause free circulation of air. The object in having large shafts is that the ore extracted will help pay expenses, they will be easier to sink, and if carried down to a depth of 1,000 ft., still following the vein, they will serve for the circulation of air in developing the property to that depth.

The work of sinking should be carried on simultaneously in all the shafts until they are down to the same level, but if ore is needed, connecting drifts may be started between the shafts at the 500-ft. level, wide enough for two sets of timbers, and boarded up tight between the sets, thereby aiding the circulation of air, which is of great importance in expediting the work. If the vein is large at this level, these drifts may be run in a straight line under the direction of a surveyor, by which a freer circulation of air is attained through all the workings.

The dip and size of the vein will be defined by these operations, and the value of the ore demonstrated, so that the advisability of sinking a permanent vertical shaft in the most suitable situation for hoisting and transporting the ore, may be determined.

The futility of sinking vertical shafts in the foot-wall of a vein is shown in Fig. 1, as the vein dips from the shafts, and the several cross-cuts lengthen at every additional level; it would be more advisable and economical to sink one large permanent vertical shaft, so that the vein may be reached by short cross-cuts. This shaft may be divided into four hoisting compartments, with a larger compartment to be used as a pump or sinking-shaft. The temporary hoisting engines, with capacities

of 1,000 ft., may be installed on each side of the shaft, so that in the event of further development being required, either hoist may be replaced with one of greater capacity, without interfering with the operation of the other. This shaft may be put down to the same depth as the 1,000-ft. level projected for the other shafts, and the cross-cut run to the vein before the temporary shafts have arrived at that depth, as in this instance the collar of the shaft, as shown, is 500 ft. lower, and the shaft will need to be but 500 ft. deep. When the vein is reached, the cross-cut is continued to the foot-wall of the vein, and then the proper place for the connecting drifts from each side may be determined, and they can be driven as rapidly as possible toward each of the end shafts; while this work is progressing, a raise may be started from the cross-cut to connect with the centre shaft.

By this time all plans and estimates should have been made for the permanent machinery and buildings, which may now be erected in readiness for continuous and economical operation. In some instances a large quantity of water is encountered that is expensive to handle, and if the amount should increase to such an extent as to necessitate the use of pumps, work must be stopped until connections are made with the centre shaft, and the lower permanent shaft cross-cut, as then pumps may be installed in the main shaft, making the lift only 500 ft. All later developments may be planned and executed from this shaft as the starting point.

When all the shafts and connecting drifts are completed on the 500-ft. level of the central shaft, stoping may begin and sinking should be continued until a point 500 ft. deeper is reached, when the vein may be tapped by another cross-cut, and connecting drifts run as in the upper level; connections with the shafts should be made by raising, as far as possible. If this work is pursued with dispatch, a good amount of ore may be extracted in development, without drawing on the reserves in the upper levels, which should be allowed to remain until the extent of the payable orebodies is determined, and the most practical and economical methods for its extraction and treatment have been decided upon.

In Fig. 2 is shown a plan of the 2,000-ft. level at the main hoisting shaft, all the shafts connected by drifts, cross-cuts, and raises, with a system of tracks by which the ore may be run out to the main shaft, and dumped into skip chutes, at a minimum cost. The shaft should be equipped with hoisting machinery of greater capacity than is immediately required, to provide for any possible increase in production.

In Fig. 1 an elevation is given that shows a vertical shaft sunk in the foot-wall, on the top of a hill, and a vertical shaft sunk to intersect the vein 500 ft. lower. It may be estimated how much may be saved by discontinuing the use of the upper shaft at the 1,000-ft. level, and hoisting from the lower shaft. The first cost in sinking 2,000 ft. and running long cross-cuts every 100 ft., the cost of hauling the ore to the shaft and then hoisting it to the top of the hill, where it must then be transported on the surface down to the same level as the lower shaft, all add greatly to the total mining cost. A study of this illustration should convince anyone that an enormous amount of money may be saved in opening and operating a mine situated as this one is, by following the above method of development.

One of the first things to be borne in mind in starting operations, is the question of ventilation, for upon this much depends; a good air supply is of great benefit to employers and employees alike, as with a perfect system of ventilation, more and better work can be performed. When this subject is misunderstood or disregarded, in

current of pure air to travel in the downcast shaft at a high velocity.

While in the north of England during the winter of 1905-6, I was invited to inspect a curiosity; it was called a 'Sirocco' fan, at Pelton colliery, county of Durham, and through the courtesy of Mr. Thompson, the mechanical engineer, I am able to give this information; the fan is 75 in. diam., and is placed about centrally between two large Guibal fans, one 30 ft. diam., the other 36 ft. diam., and is used alternately with the two large fans, exhausting over 220,000 cu. ft. of air per min., at a water gauge of about 2½ in., and doing 12½% more work; the air in circulating through the mines travels over five miles. It is a splendid illustration of the vacuum system.

There are several different designs of mechanical ventilators used; the Guibal has been the most extensively used for many years, and has given good satisfaction. The old system of furnace ventilation seems to have been abandoned entirely, it proving a reliable system for many years, but like everything else, becoming obsolete with modern progress.

Decisions Relating to Mining.

Specially Reported for the MINING AND SCIENTIFIC PRESS.

Where a miner was injured by the falling of rock from the roof of the mine where he was working, in an action for damages it was held proper for him to prove by expert evidence the usual methods followed in the protection of the miners from danger by falling rock.

Spencer v. Bruner, (Mo.) 103 S. W. 578. (June, '07.)

A contract giving the privilege of entering on certain land for a term of years and drilling for gas or oil, and conveying a certain part of any gas or oil found, was held not to be a lease of the premises, but the sale of an option to exercise or not the privilege granted as the second party might choose.

Pittsburg & Co. Pav. Co. v. Bailey, (Kans.) 90 Pac. 803. (June, '07.)

A location on the discovery of a mineral-bearing vein, made on land subject to location, was not rendered entirely void because corners were not placed on unappropriated land subject to location; but such location was valid to the extent that it was within the marked boundaries and on unappropriated land.

McElligott v. Krogh, (Cal.) 90 Pac. 823. (June, '07.)

A mining location made in good faith, but which included within its boundaries more than the statute permitted, being more than 300 ft. on each side of the middle of the vein at the surface, was held to be void only to the extent of the excess.

McElligott v. Krogh, (Cal.) 90 Pac. 823. (June, '07.)

Where locators failed to place a monument at an intervening point on the line between the end monuments, as under their mistaken belief as to the accuracy of the location of the end monuments, there could be no necessity for it, they were entitled to have the line established on the correction of the location of one of the end monuments, which would include the corrected corner, that point, and the original corner not corrected, where no part of such line was more than 300 ft. from the middle of the vein; and on the correction of this corner, the court was not required to fix the boundary line as a straight line between the corner corrected and the original corner not corrected.

McElligott v. Krogh, (Cal.) 90 Pac. 823. (June, '07.)

Where the apex of a vein between two points was outside of the mining claim, and entirely within the boundaries of another, it was held that no extra-lateral rights in favor of the owner of such former claim could apply as to segment of the vein between such points.

McElligott v. Krogh, (Cal.) 90 Pac. 823. (June, '07.)

The Prospector.

Enquiries sent to this department are answered free of charge, if submitted by subscribers who are not in arrears. The full name and post-office address of the sender must be given, otherwise no answer will be made. Those who are not subscribers must accompany their questions with a fee of \$3 for each question. No assays are made.

The specimens sent from Rockland, Nev., by E. C. L. are: No. 1, Garnet; No. 2, Granite; No. 3, Andesite.

The specimens from G. W. O., of Twining, New Mexico, are: No. 1, Diorite Porphyry; No. 2, Rhyolite.

The pebble sent by H. B., of Drew, Ore., is Magnetite in mica schist. The other specimen is Amphibole Schist.

W. W. C. sent from Galice, Ore.: No. 1, Graphite; No. 2, Quartz, Granite, Magnetite, and Pyrite; No. 3, Serpentine; No. 4, Serpentine; No. 5, Serpentine, Chlorite, and Epidote; No. 6, Quartz Schist; No. 7, Pyrrhotite.

F. S. C., of Villa Grove, Colo., sends: No. 1, Sandstone stained with copper; No. 2, Sphalerite and Chalcopyrite in a gangue of fluorite; No. 3, Sphalerite and Chalcopyrite in a gangue of quartz; No. 4, Argentite in quartz.

The specimens from M. J. S., of Palomas, Ariz., are: No. 1, Andradite and Quartz with seams of chrysocolla; No. 2, Hornblende, Mica, and Garnets in calcite; we could detect no tin or zinc; No. 3, Calcite; No. 4, much altered igneous rock; No. 5, probably a much altered Andesite.

The specimens sent by F. H. S. from Whyecomagh, Nova Scotia, are: No. 1, Quartzite; No. 2, Actinolite; No. 3, dioritic Gneiss; No. 4, dioritic Gneiss; No. 5, Chlorite; No. 6, Titanite; No. 7, granitic Gneiss; No. 8, dioritic Gneiss; No. 10, dioritic Gneiss; No. 12, dioritic Gneiss; No. 13, dioritic Gneiss; No. 14, dioritic Gneiss carrying reddish garnets; No. 15, quartz Schist carrying molybdenite.

The specimens marked H. L. S., Mexico, are: No. 1, Pyrrhotite; No. 2, Pyrite and Chalcopyrite; No. 3, Pyrrhotite and Chalcopyrite; No. 4, Pyrite and specular Hematite; No. 5, Chalcocite and Malachite in quartz; No. 6, graphitic Schist; No. 7, Andesite; No. 8, Andesite; No. 9, Andesite; No. 10, altered Andesite with amygdulæ of epidote; No. 11, Andesite; No. 12, Dacite; No. 13, Andesite; No. 14, Andesite.

SUEZ CANAL.—The navigable dimensions of the Suez canal are now practically double what they were 20 years ago, the superficies of the vertical profile having been increased from 320 to 580 sq. m. in the ordinary channel, and to 740 sq. m. in the numerous crossing places, the dredging being so carried out as to exceed the limits originally agreed upon. The tariff for laden ships, it will be remembered, was reduced at the beginning of 1906. In that year 3,975 vessels, with a net tonnage of 13,445,504, passed through the canal, as compared with 4,116 vessels of 13,134,105 tons in 1905. The mean duration of transit remains about the same, namely, 18 hours for all vessels, but the general effective rate for mail steamers is 15 hours. The length of the canal is 100 miles, and the ordinary rate of speed is 6½ miles per hour. The use of the electric light is practically universal, amounting to 97%. Out of a total of 3,975 vessels, 2,333 were British, a decrease of 151 vessels as compared with 1905. British net tonnage was 8,299,931 tons, a decrease of 57,000 tons as compared with 1905.

The Fairmont Hotel.

A photograph of this splendid structure is reproduced here on account of its general interest and because it will emphasize the fact that San Francisco has a hotel fully worthy of her past reputation as a place of sumptuous rest. The photograph was taken just before the renovation of the building was finished. At the time of the earthquake-fire the Fairmont was being fitted for habitation and the conflagration gutted the building, without serious injury to the main structure. The hotel is now open and, under the management of the old Palace Hotel staff, it promises to perpetuate the tradition among mining men that San Francisco is a good compensate for the

Manjak.

Manjak is the local name applied to the glance pitch which occurs commercially, so far as known, upon the island of Barbados alone. Manjak is a variety of asphaltum which somewhat resembles gilsonite (nintahite) in appearance, but it is more brittle and friable. The material is reported as occurring in veins which vary in width from one-fourth of an inch to 30 ft. The veins have a general north-northeast strike and varying dip. The country rock is an argillite or shale which, in places, is so saturated with bituminous matter that petroleum has been produced by destructive distillation at the rate of 37 gal. per ton of shale. Manjak is a pure hydrocarbon



The Fairmont Hotel, San Francisco.

rigors of life in the mountains and deserts among which mineral deposits are exploited.

TOPAZ IN CEYLON.—Among the precious stones gathered from the widely distributed gem gravel of Ceylon, topaz is fairly abundant, but the bright yellow variety is absent. What is spoken of as topaz among Ceylon gems is the rarer and harder oriental topaz, or yellow sapphire. The name of 'king topaz' is applied to pink or flesh-colored sapphire. The true topazes of the gravel are either colorless or light green, occasionally also pinkish-yellow or yellow brown. The first variety is cut and sold under the name of water-sapphire, which belongs properly to iolite (cordierite); the name is entirely misapplied, as the true water-sapphire is blue. The green topazes are sold, with true beryls, as aquamarines. The pinkish-yellow stones closely resemble those from Brazil, but with the curious difference that while the latter turn to a clear pink on being heated (the so-called burnt topaz), the Ceylon stones are absolutely decolorized by heat. The source of the gems is not known, as they are obtained only from the gravel, but it must evidently be in the granite intrusives of the Balangoda group.

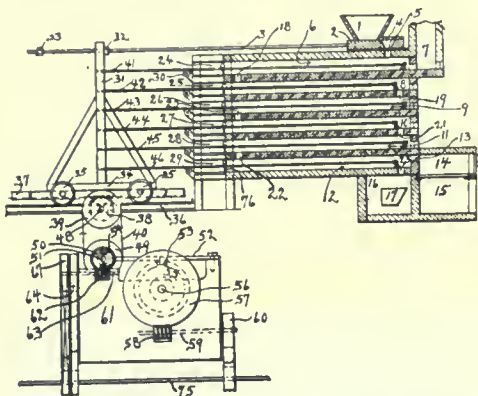
compound and is used in the manufacture of high-grade waterproofing, varnishes, and insulating compounds. The annual production of manjak in Barbados for five years was as follows: 1901, 1,168 short tons; 1902, 1,033; 1903, 728; 1904, 707; and 1905, 725 short tons. The price free on board cars given by the shippers was from \$30 to \$54 per short ton, according to quality. The official average value is stated to be \$42 per ton. The entire output of the mines is exported, there being no local consumption of manjak.

ARSENIC IN COKE.—For some time past efforts have been made in England to produce a coke free from arsenic, and the latest process is being commercially developed by the Arsenic-Free Coke Syndicate, Edinburgh, who are making arrangements for granting licenses for individual gas works or for districts. As practically applied, the process consists of sprinkling upon the coal, prior to putting it in the retort, a small quantity of common salt—about 2 oz. of salt to the ton of coal. In large works, where a coal breaker is in use, an automatic sprinkler can be fitted to spread the correct quantity over the coals.

MINING AND METALLURGICAL PATENTS.

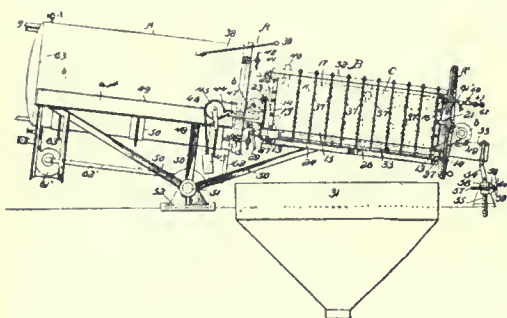
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AUTOMATIC ORE-ROASTING FURNACE.—No. 864,330; William F. Oesterle, Marion, Indiana.



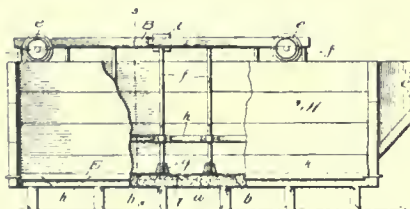
In an automatic ore-roasting furnace, a series of ore-roasting floors, each with an air-lock, with a series of rakes, one in each floor, said rakes each having a flap pivotally connected to the cross-bar of same, which flaps are alternately on either side of the rake teeth so as to keep the ore moving toward the delivery, with means for moving said rakes, said means comprising a car which has an automatic intermittent reciprocating motion.

FILTERING APPARATUS.—No. 864,308; David J. Kelly, Salt Lake City, Utah.



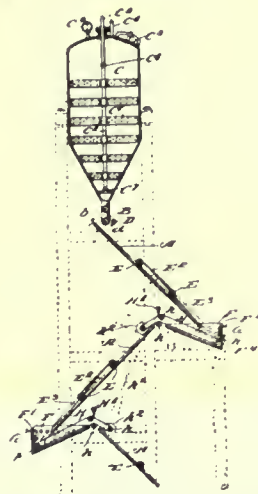
An apparatus of the character described comprising a closed tank, a carriage slidably mounted thereon, a support upon which the carriage is movable outside the tank, said carriage containing a filter medium, means for supplying a solution to the tank under pressure whereby the liquid matter is forced through the filter while the solid matter is collected upon the outside of the filter, means for delivering the separated fluid outside the tank, and an automatically operating stripper or scraping mechanism operating co-ordinately with the outward movement of the filter-frame carriage to detach the solid matter adhering to the filters.

APPARATUS FOR TREATING ORES.—No. 864,642; Joseph C. Hames, Goldfield, Nevada.



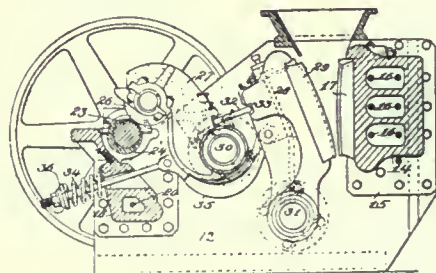
In an apparatus for the treatment of ores, the combination of a tank having a bottom of stone, and an agitator arranged in said tank crosswise of the same, and comprising a plow or muller of stone movable rectilinearly in the direction of its width to and fro over the said bottom of the tank, and a plurality of pipes movable with and extending down through the plow or muller at intervals in the length thereof to the underside of said plow or muller, and adapted to be connected with a source of liquid supply.

PROCESS OF SEPARATING ZINC-BLENDE BY FLOTATION.—No. 864,597; Auguste J. F. de Bavay, Kew, Victoria, Australia.



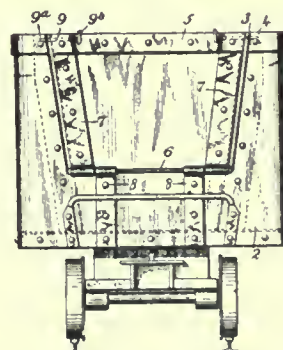
A process of separating zinc-blende particles from ore, tailing, and concentrate in a pulverized condition comprising the freeing of zinc-blende particles from the carbonates and other impurities by first submitting the material to the action of a chemical re-agent, and then discharging the material in a film-like manner into a body of water by delivering the material in a thin pasty condition in the presence of a stream of water upon an inclined surface extending to said body of water, and then separating the zinc-blende floating on the water from the remaining ore, tailing, or concentrate which precipitate in the body of water.

CRUSHER.—No. 864,573; Thomas L. Sturtevant, Quincy, and Thomas J. Sturtevant, Wellesley, Mass., assignors to Sturtevant Mill Co., Portland, Me., a Corporation of Maine.



A crushing machine the frame of which comprises two longitudinal side plates, a parallel intermediate plate, and front and rear cross-beams separate from but secured to said plates, combined with a cam-shaft having its bearings in said rear cross-beam.

MINE-CAR.—No. 863,971; Thomas M. Edmondson Los Angeles, and Duncan Ferguson, Havilah, California.



In a mine car, a box body having a partial end wall, hinge bars extending transversely of said wall, a gate provided on its ends with hinge rods, and gate jambs extending vertically across said end wall and adapted to bear against the ends of said gate.

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TABLE OF CONTENTS

Editorial:	Page.
Notes.....	347
The Institute and Advertising.....	348
Green Gold.....	348
By the Way	349
General Mining News	351
Special Correspondence	356
Johannesburg, Transvaal.....	Deadwood, South Dakota
Denver, Colorado.....	Toronto, Canada
Butte, Montana.....	Mexico City
	Morenci, Arizona
Concentrates	362
Discussion:	
Green Gold.....	Frank A. Leach 363
Mining Buildings and Mining Education.....	
	C. O'Brien 363
Articles:	
Square-Set Mining and a Modification of It.....	
	Claude T. Rice 365
Dumping Residue at Kalgoorlie.....	
	M. W. von Bernwitz 368
The National Forests.....	370
The Institute and Advertising.....	371
Old Methods in Mexico.....	372
Mechanical Treatment of Gold Ore.....	W. J. Adams 374
Copper Converters, Hydraulically Operated.....	
	G. B. Shipley 375
Mining and Metallurgical Patents	377
The Prospector	374
Departments:	
Personal.....	350
Obituary.....	350
Market Reports.....	350
Books Received.....	378
Commercial Paragraphs.....	378
Catalogues Received.....	378

Editorial.

WE ARE IN RECEIPT of two specimens of the gutter press—the *Critic* and the *Graphic*. Even of their own kind of drivel they are weak exemplars, for the first contains a foolish attack on Mr. Benjamin I. Wheeler, the president of the University, and the other is seemingly dedicated to the flattery of Mr. Patrick Calhoun. Mr. Wheeler wins more by the enmity of this type of journal than Mr. Calhoun from its support. We shall be glad if the publishers of these two sheets will cease sending them to us.

TURBINE STEAM-ENGINEERING has gained by the successful voyage of the *Lusitania*, which is likely to do even better under more favorable weather. With the successful application of the turbine in propelling a vessel of the largest size, there has been made a great advance in ship-building, and there is every reason to expect that the Atlantic voyage will be shortened to five days or under. In the meanwhile the turbine has scored against the reciprocating engine.

SCARE HEAD-LINES are often more amusing than startling. Thus the doings of the Mining Exchange in San Francisco are given an air of stupendous importance by the irresponsible scribblers of the daily press. Some quite insignificant transactions in Goldfield Consolidated are described by the *Evening Scream* as an "awful bear raid" and by the *Morning Howl* as a "semi-panic." As a matter of fact 1,500 shares changed hands (which does not mean that they were bought or sold) and the price sagged between \$7.55 and \$7.05. This constituted the "bear raid" and the "semi-panic." Stock exchanges perform a useful function, and the one devoted to mining stocks in San Francisco doubtless is a necessary institution, but if the small business transacted does not make it unimportant, the press reports assuredly make it ridiculous.

MACHINERY once erected usually stays on the mine for which it was bought. It is not often that mine operators confess to failure and are willing to move a plant elsewhere. And yet it is a commendable thrift that desires to prevent the loss due to leaving perishable material on an idle mine. For this reason we are glad to record the removal of two gold dredges from Colorado to California. The National and the Clear Creek dredging companies were organized to exploit the gravel of a stream not far from Denver; they failed, either because the testing of the ground by drilling was badly done or the cores were 'salted'; in any event, the returns from dredging entirely failed to confirm expectations based on the drill-holes. Each company built a dredge and it is these machines that are being deported

to Jenny Lind, in Calaveras county, on a tract known as the Dennis ranch, where the Calaveras Gold Dredging Company is at work. The Colorado companies have been consolidated with the Isabel Gold Dredging Company and they will try their luck on this side of the Sierra. We wish them good fortune. Dredging is a most satisfactory form of mining when conditions are favorable. These conditions are various. But dredging is no more free from possibility of blunders than any other form of human activity and it is no more an infallible investment than, for instance, mining on the Rand, which for many years was claimed to be vastly superior to any other type of gold mining. Mining is, was, and will be, to the end of time, a sane speculation or a silly gamble, but never an 'investment'. The element of risk is never eliminated; any statement to that effect as regards a particular mine is made only by the charlatan or the fool.

THERE IS an unconscious humor in the titles of articles that happen to be thrown together. Thus in the last issue of *Science* there is an address delivered by Theodore W. Richards at Berlin, in the presence of royalty; so it begins: "Your Excellencies, Your Magnificences, Ladies and Gentlemen." After the published address comes a review of 'The Warblers of North America,' but Professor Richards is not mentioned specifically, and then Mr. W. F. Rigge has an article on 'Seeing the Lightning Strike.' Luckily it never strikes twice in the same spot.

Green Gold.

THIS does not refer to any one of the promoting activities of Col. W. C. Greene nor to the kind of precious metal that deceives the 'tenderfoot' in the West or the 'new chum' in Australia. Not long ago we read, in an Arizona paper, of a mine that produced a green variety of gold, which, on account of its color, brought a higher price than \$20.67 per ounce, the value of pure gold. We might have thought the incident merely one of the vagaries of the daily press had we not happened to know that there is an alloy of gold and silver that is green. Several years ago the present writer bought a nugget at Kanowna, in Western Australia; the gold of this nugget was of the usual reddish yellow color and it came from Siberia, a locality in Western Australia that gave a name to one of the disastrous 'rushes' of 1896. Subsequently, the gold was used for making a ring and the jeweler was told to add a little silver so that the metal might not be too soft. The resulting alloy had a distinctly green cast. Remembering this, and prompted by reading the story from Arizona, we wrote to Mr. Frank A. Leach, superintendent of the San Francisco Mint and recently appointed Director of the United States Mint. Mr. Leach sent a reply, which appears under 'Discussion' and which proves that gold and silver when melted in a certain proportion, and without the presence of copper, will give a green alloy. Of course, gold in thin plates is green by transmitted light; it is a vivid green. There does not appear to be any connection between the two phenomena

—for when we do not know what a thing is we call it a phenomenon. The green gold has a certain beauty of its own and it may become used in jewelry and the arts. Is it possible that the two metals when alloyed in a certain proportion cease to be a mixture and become a true compound, with qualities different from either component?

The Institute and Advertising.

ON ANOTHER PAGE will be found correspondence relating to the sale of advertising space in the Bulletin of the American Institute of Mining Engineers. It is not unkind to say that the inclusion of advertisements was a regrettable departure. It may have been necessary; we know of no obvious substitute able to make the money needed by the Institute. We do know, however, that the same question—of an increased income—came before the Institution of Mining and Metallurgy, at London, and the suggestion to sell advertising space was put aside without hesitation. It was deemed bad form. Concerning taste and colors it is useless to dispute, so that "bad form" is a kind of argument that stifles discussion. We do assume, however, that as the council of the Institute agreed to the placing of advertising in the Bulletin, it is not bad form in the eyes of men well qualified to judge. And yet to this we must add that the council of the Institution at London includes a large proportion of American mining engineers and that it is so constituted as to be international in character. Therefore the interposition of the Atlantic does not affect the different decision reached by the two councils. Of course, the financial condition that led to the taking of advertisements was due to Mr. Carnegie's gift. In that gift we never took any pleasure, because we consider Andrew Carnegie the first of the great rebaters, an unscrupulous financier, and the type of man who having amassed a colossal fortune by devious ways now poses as a providence to the unthinking. Most of his gifts have a sting to them. *Timeo Danaos et dona ferentes*. The building of the United Engineering Societies is a sad example. Our Institute has obtained spacious quarters only to feel the pinch of poverty. When Mr. Carnegie gave the building, why did he not donate the ground also? It would have been a small matter. And now the Institute is saddled with a debt of \$180,000 (partly liquidated by subscriptions) and with increased expenses. How are these to be met? Wishing to be helpful, rather than merely critical, we venture to suggest that the dues of residents of New York and its immediate vicinity be increased, as they get the benefit of the new quarters, especially the library. There are about 400 members living in New York and its environs; whatever benefit the Institute may have got from Mr. Carnegie's gift, most of it has been theirs. To them the Building serves many purposes not within the reach of those that live at a distance; to them the library ought to be of great value, to the others it is of no use. To them is owing the acceptance of Mr. Carnegie's gift and to them we must look for a solution of the problem. We hope to receive some suggestions.

By the Way.

The record time made by the *Lusitania*, which made the Liverpool-New York passage in 5 days and 54 minutes, gives point to the following account of Atlantic travel, as published in the *Evening Post* of New York:

Time was once, and not so long ago either, when the 14-day boat excited the wonder, the admiration, and the general furore that the 4-day boat will excite next month, next year, or whenever it comes. One can imagine the mirth of the seamen along the British coast when, in June, 1819, a New York-built ship of prodigious ngliness, with a chimney amidships from which a dense volume of smoke was escaping, made up the Mersey. They thought she was on fire until Capt. Rogers, in answer to offers of assistance, explained that she was a steamboat. So she was, the first ever to cross the Atlantic under steam propulsion. She took 25 days to make the trip, 18 days steaming and 7 under sail alone.

Viewing the performance today it was nothing to speak of, but at the time it was better than the average time of the 'wind-jammers.' It was 19 years before another steam-driven vessel made the passage. For sail-powered packets were entirely satisfactory as the traveling and shipping world saw things then. Eighteen and twenty days were the quick passages of these packets.

In 1838, the *Sirius* and *Great Western*, two steamships, British built and British manned, crossed the ocean successfully. They were boats of 700 tons. They were of wood. Then came the record of the *Great Western* in 14 days.

The Cunard line was organized in 1840, appearing in the trans-Atlantic field with a quartet of wooden sidewheelers. The Yankee sail-packets beat these boats occasionally, but not often enough to defeat the object of the Cunard line in obtaining the best of the passenger and freight traffic. As an instance of the general build of the earliest Cunard liners, it might be pointed out that the *Britannia* was 207 ft. long, about the length of an average steam yacht, 32 ft. wide, 22 ft. deep, with tonnage of 1,155, and speed of 8½ knots an hour. With these boats the English line continued in the lead until in 1850, the ill fated *Collins* line, American to the backbone, was organized, building four vessels the size and magnificence of which were relatively far greater in comparison to the ships of contemporary lines than the *Lusitania* is today. There was the *Arctic*, 2,856 tons, *Atlantic*, 2,815 tons, *Baltic*, 2,723 tons, and the *Pacific*, 2,707 tons. They were driven by side-wheel side-lever engines of 800 hp. The American liners at once showed their superiority to the Cunarders so far as speed, at least, was concerned. The *Collins* boats cut the time to nine days and a few odd hours.

In the years 1854 and '55, the *Collins* line sustained losses of two of its crack vessels, the *Arctic* going down in collision with a French steamship, and the *Pacific*, leaving Liverpool for New York in January, 1856, steaming to an unknown bourne, whence never a splinter of her returned to tell the nature of the tragedy. From that time on Americans were never especially prominent in the fight to reduce the time across the ocean. The Cunard continued building new steamships, and in 1856 the *Persia* made a record of 9 days, 1 hr., whereupon people began to talk of the possibility of the eight-day boat. It came, 10 years later, in 1866, when the *Scotia* crossed in 8 days, 2 hr. The *City of Brussels*, three years later, crossed in 7 days, 22 hr. Of course these vessels were all of the screw type, the paddle-wheel boats going out for the most part in the early 'seventies. The *City of Berlin*, in 1875, pulled down the record to 7 days, 15 hr., and in 1876 and 1877 the *Britannic* and

Germanic, both of the White Star line, held the honors in turn, the *Germanic*, 7 days, 11 hr., and 37 min.; the *Britannic*, 7 days, 10 hr., 54 min. Then, in 1880, came the *Arizona*, of the Guion line, the first boat with watertight compartments. She crossed in 7 days, 7 hr., and 23 min. The *Alaska*, of the same line, established a record of 6 days, 18 hr., 37 min. in 1882. One can imagine the furore that made. In 1884 the *Oregon*, of the Cunard, crossed in 6 days, 11 hr., 9 min. All these records were made on the New York and Queenstown route, from Sandy Hook lightship to Roche's Point.

This company took a firmer grip on trans-Atlantic supremacy in 1885, when it brought out the famous *Etruria*. She lowered the record to 6 days, 4 hr., 43 min. But she held the blue ribbon only two years, another Cunarder, the *Umbria*, coming along and making the record 6 days, 4 hr., and 42 minutes.

It was an American line that first brought out the five-day boat, the *City of Paris*. It is true she was built in a British shipyard and sailed by British seamen under the flag of Great Britain, but at least American capital was responsible for her production. In any event, in 1889, the *City of Paris* crossed the ocean in 5 days, 19 hr., 18 min. Naturally the English merchant marine viewed this performance with envy, and the result was the production of the twin steamships, *Majestic* and *Teutonic*. The *Majestic* in 1891 shattered the *Paris's* record by just one hour and ten minutes. The *Teutonic* did not allow her sister to enjoy her honors for long, breaking the record herself in the same year—5 days, 16 hr., 31 min. In 1893, the *City of Paris* came into her own again, making the trans-Atlantic passage in 5 days, 15 hr., 58 minutes.

Again the Englishmen entered the lists, this time launching those two magnificent steamships, judging even from the standpoint of today, *Lucania* and *Campania*. In 1893, the *Campania* took the record away from the *City of Paris*, now the American liner *Philadelphia*, with a passage of 5 days, 12 hr., 7 min.

In the meantime, over the Southampton course, which is about 3,184 miles, whereas the Liverpool-Queenstown course is considerably shorter, 2,800 miles, the Hamburg-American liner *Fürst Bismarck* in 1891 made a record of 6 days, 14 hr., 15 min.

In 1900 the great Hamburg-American flyer *Deutschland* appeared. The product of the Vulcan Iron Works at Stettin, carrying with her all the hopes of German supremacy, she started from Plymouth for New York on her maiden voyage in July, 1900, and lowered the record to 5 days, 14 hr., 23 min. She made an average speed of 23 knots an hour over a course of 3,085 miles.

When the *Deutschland*, and before her the *Kaiser Wilhelm der Grosse*, captured the speed honors of the sea, British builders began the development of the cargo and passenger vessels of tremendous carrying, but of mediocre speed, capacity. As a result, one has but to glance at the *Baltic*, *Adriatic*, *Arabie*, *Cedric*, and other comparatively sluggish leviathans of the White Star line.

But in their hearts the British, as well as all the rest of the world, appreciated the full value of speed, as a war asset, if not a commercial necessity. And so, while the Germans waged their battle fiercely, while the shipbuilders of Stettin strained over the problem of drawing a fraction of a knot extra speed out of their reciprocating engines, the English turned their attention to the turbine. Inspired by the success of that little British warship *Turbina*, marine engineers spent their days in experiments, until at last, under direct Governmental encouragement of the most substantial sort, the Cunard liners *Carmania* and *Caronia* were evolved.

They but led the way for the *Lusitania* and *Mauretania*, upon which boats the turbine system will stand.

Personal.

CURTIS H. LINDLEY is at Tonopah.

A. G. CHARLETON is in Switzerland.

G. SIMPSON PITCAIRN is in British Guiana.

E. A. H. TAYS has returned to Denver from Butte.

J. B. PITCHFORD has returned to Berkeley from Oregon.

H. C. HOOVER left London for Burma on September 18.

J. POWER HUTCHINS is expected in San Francisco from Alaska.

LOUIS C. RALSTON, of Berkeley, has taken offices in San Francisco.

JOHN A. REID is engaged in work for the U. S. Geological Survey.

H. S. DENNY, lately at Johannesburg, has been visiting the mines of Butte.

ALBERT ROBERTS has returned to Chicago after four months' work in Mexico.

PERCY ROLFE has been appointed manager of the Keystone mine, in Wyoming.

ARTHUR C. NAHL is on his way to Butte City, and from there he will go to Wardner, Idaho.

W. H. WILEY passed through San Francisco on his way from Los Angeles to Nevada and Idaho.

CHARLES F. NOURSE is proceeding from St. Petersburg to Kyshtim, in the Ural mountains, Russia.

JOHN D. IRVING is in Alaska. He has accepted the professorship of economic geology in Yale University.

HENRY F. LEFÈVRE is examining mines near Guadalajara, Mexico. He will be in New York by October 20.

FREDERICK S. HARRIS has retired from the management of the Kansas City-Goldfield Mining Co.'s properties at Goldfield, Nevada.

R. B. STANTON, who has spent the summer in charge of placer mining operations in Siskiyou county, California, is returning to New York.

R. B. WATSON and WILLIAM WATSON have formed a partnership under the name of Watson & Watson, with offices at 25 Broad St., New York.

R. M. ATWATER, JR., M. W. ATWATER, ROBERT LINTON, and R. DE SALLIER constitute the newly organized firm of Atwater, Linton & Atwater, at Helena, Montana.

THOMAS T. READ, professor of mining and metallurgy in the Colorado College, at Colorado Springs, has received an appointment as professor of metallurgy in the Imperial University of China, at Tientsin.

Obituary.

HENRY ASHE TILGHMAN, a native of California, died in San Francisco on September 10, at the age of thirty-five. He was a graduate of the Columbia School of Mines, class of 1893. He had held positions of importance, both as manager and consulting engineer, in South Africa, where he lived 12 years on the Rand and in Rhodesia. After January, 1907, he was resident manager of the Hot Creek Consolidated Mining Co. at Hot Creek, Nev. His health had been failing for some time. A skillful and conscientious engineer, a charming companion, and courteous gentleman, his death so early in life will be deeply regretted by his friends the world over. He leaves a widow and one son.

Structural Material.

Base prices f. o. b. cars San Francisco.

Brick, common, per M.....	\$8.50
Cement, domestic, per bbl.....	\$2.05 (a 2 10)
Cement, foreign, per bbl.....	\$2.75 (a 3.25)
Firebrick, domestic, carload lots, per M.....	\$37.50
Firebrick, English " ".....	\$50.00 (a 55)
Lime, per bbl.....	\$1.25
Lumber, Ord. Dimension Stock, f. o. b. Gray's Harbor, per M.....	\$12.00 (a 13)
Mining timbers, f. o. b. Gray's Harbor, per M.....	\$11
Nails, per keg.....	\$3.25

Latest Market Reports.

LOCAL METAL PRICES—Sept. 19.

Antimony.....	17@20c	Quicksilver (flask).....	\$38@39
Copper.....	18@20c	Spelter.....	7@ 7.75c
Pig Lead.....	4.85@ 5.80c	Tin.....	40.50@42c

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.

Date	Electrolytic Copper	Lead	Spelter	Silver
Sept. 13.....	15½	4¾	5.15	67¾
" 14.....	15¼	4¾	5.10	67¾
" 15.....	Sunday. No market.			
" 16.....	15½	4¾	5.10	67¾
" 17.....	15½	4¾	5.10	67¾
" 18.....	147½	4¾	5.10	67¾

ANGLO-AMERICAN SHARES.

Cabled from London.

	Sept. 12.	Sept. 18.
	£. s. d.	£. s. d.
Camp Bird.....	0 19 6	0 19 6
El Oro.....	1 5 0	1 5 0
Esperanza.....	2 1 6	2 0 6
Dolores.....	1 5 0	1 5 0
Oroville Dredging.....	0 16 6	0 16 6
Stratton's Independence.....	0 2 6	0 2 6
Tomboy.....	1 6 0	1 8 0

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

MINING STOCK QUOTATIONS—NEW YORK.

Closing Prices.

	Sept. 11.	Sept. 19.
Bingham Central.....	7½	1
Boston Copper.....	17	18½
Cumberland Ely.....	6½	6½
Dolores.....	5	5
El Rayo.....	3¼	2¾
Guanajuato Con.....	3¼	2¾
Giroux Con.....	5½	5
Greene Con.....	15	18
Nevada Con.....	10½	9¾
Nipissing.....	7½	7½
Tennessee Copper.....	31	29½
Tonopah Ex.....	1½	2½
Tonopah-Belmont.....	2¾	2¾
Tonopah.....	11¼	11½
United Copper.....	53	49
Utah Copper.....	24	21¼

(By courtesy of Hayden, Stone & Co., 25 Broad St., New York.)

SOUTHERN NEVADA STOCKS.

San Francisco, Sept. 19.

Atlanta.....	\$ 44	Laguna.....	1.25
Belmont.....	2.75	Little Tonopah.....	1.00
Columbia Mtn.....	44	Manhattan Con.....	35
Combination Fraction.....	1.97	Midway.....	77
Daisy.....	1.20	Mizpah Extension.....	10
Fairview Eagle.....	1.20	Mohawk.....	15.00
Florence.....	4.00	Montana Tonopah.....	2.85
Gold Bar (Bullfrog).....	50	Nevada Hills.....	4.90
Gold Bar (Goldfield).....	25	Red Top.....	3.60
Goldfield Con.....	7.32	Sandstorm.....	50
Goldfield of Nevada.....	1.40	Silver Pick.....	52
Gold Kewanas.....	59	St. Ives.....	74
Great Bend.....	55	Tonopah Extension.....	1.45
Jim Butler.....	76	Tonopah of Nevada.....	11.00
Jumbo.....	3.50	Tramp Con.....	33
Jumbo Extension.....	1.55	West End.....	71

(By courtesy of W. C. Ralston, 368 Bush St.)

COPPER SHARES—BOSTON.

Closing prices.

Closing prices.

Name of company.	Sept. 19.	Name of company.	Sept. 19.
Adventure.....	2	Michigan.....	9
Ahmeek.....	75	Mohawk.....	58
Allouez.....	60½	Nevada Con.....	9½
Amalgamated.....	60½	North Butte.....	47
Arcadian.....	3¼	Old Dominion.....	24½
Atlantic.....	93¼	Osceola.....	93
Balaklala.....	6¼	Parrot.....	13
Bingham Con.....	87½	Phoenix.....	1
Boston Con.....	19¼	Quincy.....	79½
Butte Coalition.....	15½	Raven.....	1
Calumet & Arizona.....	114	Rhode Island.....	3½
Calumet & Hecla.....	620	Santa Fe.....	2½
Centennial.....	19¼	Shannon.....	10½
Con. Mercur.....	40	Superior & Pittsburg.....	10¾
Copper Range.....	58	Tamarack.....	66
Daly-West.....	8	Trinity.....	14½
Franklin.....	8	United Copper com.....	48
Granby.....	85	Utah Copper.....	38½
Greene-Canaan, etc.....	9½	Victoria.....	4
Isle Royale.....	14½	Winona.....	5½
Mass.....	3¼	Wolverine.....	121

(By courtesy of E. F. Hutton & Co., 490 California St.)

General Mining News.

ALASKA.

Boats are loading ore from the bins of the Omar, Rush & Brown, Mt. Andrew, and at Maple bay. The Alaska-Galena M. Co. will start shipping ore by pack-trains, pending the installation of an aerial tramway.—A hoisting engine has been erected on the Jessie claim of the Princeton M. & M. Co., near Dolomi. At the Valparaiso, owned by the same company, 25 men are working and taking out ore.—Electric drills have been installed and are working satisfactorily at the Jumbo mine of the Alaska Industrial Co. The mine produces about 2,500 tons per month.—There is a movement on foot to reorganize the Alaska Copper Co., and reopen the mine and smelter at Coppermount.—The cross-cut on the 300-ft. level, from the bottom of the shaft on the Niblack, is in good ore.

ARIZONA.

COCHISE COUNTY.

The management of the Copper Queen Co. has announced that it will not lay off any men, in spite of the decline in copper and the shaky condition of the market. This is good news for Bisbee.

GILA COUNTY.

N. H. Emmons, formerly chief engineer of the Old Dominion at Globe, has been appointed assistant manager for the Tennessee Copper Co., and will live at Copper Hill, Tennessee. H. L. Morton will be retained as chief engineer for the Old Dominion.

GRAHAM COUNTY.

The new furnace at the Shannon smelter did not get into operation as soon as expected, but will probably run during half of this month.—The Chase creek property, managed by I. N. Stevens, is said to be looking well.—A cross-cut is being run above the 200-ft. level to cut the gold vein on the Gold Belt D. & R. property. The shaft on the copper claim has been timbered and a hoist erected. First-class ore is hauled out over the wagon-road.—There is some activity in the Steeple Rock district, the nearest railroad station to which is Duncan.—Two shifts are working in the Oregon shaft of the Clifton G. & C. Co., which is being promoted by Louis Ferber.—About 50 miners have recently come to Clifton from the Copper King camp, and it is rumored that the New England company will close its mine, although it was recently announced that a new air-compressor had been ordered.

MOHAVE COUNTY.

Good copper ore has been struck 32 ft. down in the shaft of the Crow Canyon mines.—The shaft at the Treasure Hill mine is 140 ft. deep and drifts are being run on the ore. Several Missouri shareholders have recently visited the property.—P. R. Smith has arranged for the purchase of the Fairfield, Metallic Accident, and Keystone mines, in Mineral Park basin.—T. S. O'Brien will have charge of developing the Barney McCall properties in the Weaver district, for E. B. Van Deman.—The Victor power-plant at Needles will go into commission Oct. 1, and will supply 750 hp.—Will Cook of Virginia Camp has bonded his property to M. A. Moore.—Lessees have begun work on the Vanderbilt mine at Cerbat.—W. O. Young has organized a company in Salt Lake City, to take over the Kemple properties in the Weaver district.—The mill of the Stockton Hill M. Co. is making a good zinc and lead product. A 14-in. vein of clean lead ore has been opened in the raise from the 200-ft. level in the De la Fontaine mine.—A new electrostatic machine for separating zinc is being set up at the Tennessee mine.—J. F. Burkhart is examining the Red Gap mine in the Weaver district.

YAVAPAI COUNTY.

(Special Correspondence).—On the 100-ft. level of the Redman mine, belonging to the Redman M., M. & S. Co., in the Willow Creek district, a 30-in. vein of sulphide ore has been uncovered, and in the 200-ft. level, 36 in. of ore of the same character has been struck in a drift. Samples

run about \$50 gold per ton. The shaft is down 270 ft., on a steeper incline than the ore-shoot, making it necessary to cross-cut to the pay-streak. Five veins will be developed from the shaft. Plans are under consideration for a mill, and the opening of the mine to a greater depth. T. E. Campbell has taken a force of miners to the Fuller group of mines on Squaw creek, to resume development on the property. The mines are the property of the White Horse Mining Co., and consist of eight claims and two mill-sites, all patented. One of the locations, which has been worked at intervals since 1878, has a record in gold production of \$100,000. The property is equipped with a 10-stamp mill and camp buildings for the accommodation of a large force of men. The claims are opened by a series of tunnels, the topography of the ground being favorable to this system of development. Squaw creek furnishes an ample water supply at all seasons. The camp is situated six miles east of Goddard and 25 miles from Cordes Sliding, the nearest railroad station on the Bradshaw Mtn. railroad.—At the camp of the Black Rock Mining Co., Ltd., in Black Rock district, the new mill is running and the results are satisfactory.—Work on the Hale property, in this district, is progressing in a satisfactory way with an excellent ore showing in the lower levels.

Phoenix, Sept. 14.

Sinking continues in the Boston-Jerome shaft, and the showing is improving.—A company has been organized to develop ground lying between the North Verde and the Arkansas & Arizona.—The power-plant at the Mazatzal mine is in operation, and development underground continues.—L. B. Adams of New York has undertaken to finance the Jerome Arizona Copper Co., owning a group of claims north of Jerome.—The Eureka tunnel is expected soon to cut the vein for which it is being driven.—Some pay-ore has been encountered in the Dillon tunnel of the Hull group.—Three shifts are at work in the Verde Grande, and the shaft is going down.

CALIFORNIA.

AMADOR COUNTY.

The Kennedy M. & M. Co. has had a survey made for a narrow-gauge railroad from the broad-gauge terminus at Martell to the mine, a distance of 300 ft. The company will lay the ties and steel on the road at once. The track will be about level, and the material will be lowered to the lumber yards at the mine by a stationary engine.

BUTTE COUNTY.

Los Angeles capitalists have purchased the Hazelton property on Feather river, two miles from Forbestown, and have incorporated it as the Pinal Butte G. & C. M. Co. The 10-stamp mill will be enlarged and the machine-shops rebuilt.—The Mammoth Channel G. M. Co. will operate extensively near Magalia. This company owns 1,580 acres. It has 8,500 ft. of old river bed on the Mammoth channel and 5,000 ft. on the Magalia channel. Operations began in the middle of June, and contracts have been let for a three-compartment shaft and a drainage tunnel. The shaft will be sunk 800 ft. and the tunnel driven 1,250 ft. long will intersect the shaft at the 510-ft. point.

NEVADA COUNTY.

It is believed that the Jenny Lind tunnel is now within about 200 ft. of the main gravel channel, and the long series of assessments may come to an end. The tunnel is in over 1,000 ft., and some think it will encounter the same rich gravel that the Godfrey people worked years ago.—The old Black Bear mine on Deer creek, several miles below Grass Valley and beyond Randolph Flat, is looking good. The owners, Fleishecker & Co., have bonded it to James English and the Eagen Bros., and a small crew of men is working. Three veins have been cut in the 300-ft. tunnel, and the bonders will start a cross-cut tunnel from the creek and strike the largest vein at a distance of 500 ft. from the portal. Some ore from this mine was milled years ago at Southern's, and some was shipped to the Selby smelter.—Two new suits have been filed against C. Christopher, to foreclose the mortgage on the Peabody mine.—State Mineralogist L. E. Aubury is in Grass Valley to inspect the

companies have been incorporated by George L. Nye, B. B. Morrison, and H. W. Wagner, with a view to effecting this consolidation. Chicago and Kansas City capital is interested in the enterprise.

(Special Correspondence).—The Delaware Gold M. & M. Co. expects to have its 50-ton concentrating plant ready to handle ore from the old Breen property in about 90 days. The mill, when completed, will contain Wilfley tables, Ding magnetic separators, two sets of 14 by 36 in. rolls, a King screen, a 9 by 16 in. Samson crusher, and a Wilfley furnace. Charles Loughridge is the manager.

Kokomo, Sept. 9.

TELLER COUNTY.

The Cresson Consolidated Co. continues to produce 2,000 tons of ore per month, and the ore is improving in value. Richard Roeloff, the superintendent, expects soon to be producing smelting ore.—The Findley Consolidated Co., on Bull hill, will resume work at once, the ore being handled at the 40-ton experimental mill of the Findley-Vindicator companies.—The Abe Lincoln lease on the Stratton estate, in Poverty gulch, comprising 10 blocks, has been sold by the Tunnel M. & D. Co. to the Colorado State Investment Co., of which John Sharpe is manager. Some

Henniger, of Elk City, have leased for two years the American Eagle mine. They will have the mine and mill running before winter, and employ 50 men. The American Eagle is now owned by E. O'Shea, of Spokane, and associates, who acquired it last February on a foreclosure. Several months ago the owners gave Mr. Brennan and his partner a short time lease on the mill and the ore dumps, and it is certain that the clean-up from the ore on the dumps must have been good, or they would not take a lease on the mine.—E. H. Dewey, of Spokane, principal owner of the Dewey mine and mill at Thunder Mountain, says the property, which is equipped with only a 10-stamp mill, has produced during the last four years a total of \$300,000. The camp is unusually active this summer. A long tunnel is being driven on the Fairview. The Sunnyside, which has been closed down since February, has resumed. Many of the miners are stopping work and scattering to the hills to prospect, and a labor shortage is threatened.

MISSOURI.

JASPER COUNTY.

The Columbia Zinc Co., with offices in Chicago, has recently been incorporated under the laws of the State of West Virginia with a capital of \$75,000, all of which, it is said, has been subscribed. The officers of this company are Geo. S. Rice, president, and T. L. Dee, treasurer. The mine is situated in the Joplin district and drills are said to have cut four distinct veins running from 12 to 18 ft. thick. It is reported that most of the stock is owned by those interested in the Sullivan Machinery Co., and employees of that company.

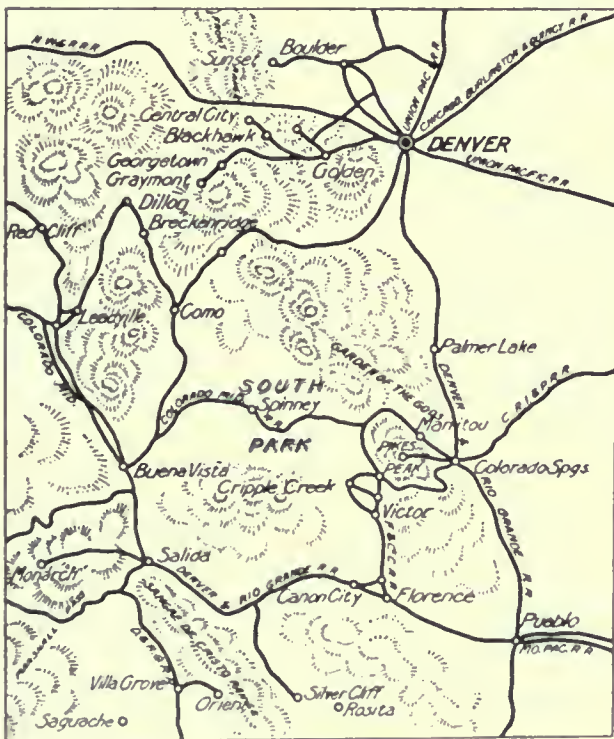
NEVADA.

ESMERALDA COUNTY.

(Special Correspondence).—At the Walker Lake mine, the shaft is down 85 ft. The vein carries a little copper, silver, and gold.—Good silver-lead ore has been found in the Nevada-Vermont.—Some gold and copper ore has been discovered in the Queen Regent group. Several quartz veins outcrop on the claims. With depth, the group will probably develop copper. The Queen Regent is owned principally by J. E. Kerr, of San Francisco.—Native copper has been found at the Copper Summit, being developed by Salt Lake parties.—At the Hunter-Murray group, ore carrying silver and lead has been found in small quantities.—A two-foot quartz vein has been found in the Rawhide. Six lessees are operating on the property. Adjoining claims are showing up well.—At the Regent much development is under way, and the mine is showing up well. Shafts are being sunk and tunnels and cross-cuts driven.—At the Steinhelmer, good ore is being developed.—The Placeers near Mount Grant are attracting considerable attention. Several strikes are reported, and a large number of prospectors are exploring the district.—A large body of silicious copper ore is being developed in the Dunlap by the Tonopah M. Co. Some native copper is found in this property.—The Champion is shipping ore and is being developed. Goldfield people control the mine.—A Goldfield man has secured control of the Wonder, and is sinking a double-compartment shaft. Good ore is being developed.—At the Blue Light some low-grade and a little high-grade ore is being developed. Dan Storms is superintendent.—On the Vengeance group, two shafts are being sunk, and two gasoline hoists are in operation. Some ore is being developed. The group is controlled by Joseph Gloux, formerly manager of the United Verde, and now an operator at Ely.—At the Lost Confidence, a vein of copper ore is being developed. Ore running up to 10% is being sacked for shipment. The Big Strike, near Fitting, is showing well. It is being developed by Malcolm McDonald and associates.

Schurz, Sept. 12.

The mines of Goldfield produced 2,466 tons of ore during the week ending Sept. 14, with an estimated value of \$290,000. The shutdown at the Mohawk gave some of the bad ground a chance to cave, so operations will be hindered at that property until this ground is caught up. The output of the Little Florence has also been light. During the



A Part of Colorado.

new ore was recently opened on the 300-ft. level east of the shaft. The work was suspended for a short time on account of the destruction of the Golden Cycle mill.—The Trilby mine, situated on Bull hill, has resumed work after a short shut-down. Plans for the construction of a mill on the property are under consideration. The company is a Pennsylvania corporation, and L. K. Mearkle is president.—The lessees on the Modoc ground are shipping high-grade ore from above the 800-ft. level; on and below the 800 level the company is operating.

IDAHO.

IDAHO COUNTY.

A. F. Schultz, acting manager of the Del Rio M. & M. Co., announces that work will be resumed at once on the company's property at Buffalo Hump. The Del Rio was at one time one of the best known properties in the Hump district. In the upper workings more than 400 ft. of drifts and cross-cuts have been run, opening up an orebody running up to \$20 or more per ton. The lower tunnel, now in 600 ft., will be extended 2,000 ft. to get under the line showing exposed. A cargo of supplies is now being taken to the Hump for the Del Rio, including 800 ft. of air-pipe for ventilating the lower workings.—Patrick Brennan and John

week, the Nevada Goldfield Reduction works received ore as follows: Mohawk Combination, 418 tons; Little Florence, 120; Red Top, 316; Mohawk, 293; Higginson lease, 13; Hayes-Monnette dump, 29. Total, 1,189 tons. Total value about \$148,625. For the same week the Western Ore Purchasing Co. received ore as follows: Mohawk Jumbo, 664 tons; Florence Leasing & Mining, 110; Hayes-Monnette dump, 47; Little Florence, 66 tons. Total, 887 tons, having a value of about \$110,875. The Mohawk mine also shipped 130 tons of ore by rail.

The Jumbo Annex, a sub-lease of the Higginson, is reported to have struck some ore in a raise from the 176-ft. level.—The Pollard Florence lease continues development on the 300-ft. level.—The differences between the Little Florence and Florence Goldfield mining companies have been adjusted by the payment to the latter of \$177,800 for ore extracted beyond the lease lines, and the surrendering of the sub-lease on the Mohawk Florence.—The Daisy L. & M. Co. has struck a vein on the 250-ft. level.—At the

level is reached.—In the same vicinity with the Mayflower is the Puritan, headed by a group of Boston capitalists. An 85-ft. tunnel revealed an orebody, 42 in. wide, carrying milling ore. The vein is well defined, both walls being disclosed, and an incline shaft is now being sunk on the foot-wall to tap the vein at a lower depth.—On Tobin Mtn., one mile northeast of the Mayflower, is the Pioneer. A 50-ft. tunnel has been driven and a winze sunk 35 ft. The company reports that they have some low-grade free-milling ore.

Rhyolite, Sept. 6.

(Special Correspondence).—The mill of the Montgomery-Shoshone Co., erected by the Traylor Engineering Co., and owned by the Bullfrog Reduction & Water Co., is nearing completion and will be turned over within two or three weeks. The course of the ore through the mill is briefly as follows: Reduced to 1½ in. size in crusher, then to an elevator and through the sampler. Then to a storage bin whence it is drawn to rolls crushing to ⅜ in. The product is then elevated to a double-screen trommel. Oversize back to rolls, the undersize to rolls, being screened on a 16-mesh centrifugal screen, undersize going to amalgamation plates and then to a Dorr classifier, sending the sand to five Wilfleys and the fine to 10 Frue vanners. The slime goes to dewatering tanks, to which is added the slime overflow from the Blaisdell collecting tanks, and then the thickened pulp goes to Blaisdell agitation vats. The sand is handled with a Blaisdell excavator, and the slime by a Butters filter. The plant is a complete one in every detail.

Rhyolite, Sept. 10.

Two shifts are at work sinking the new shaft on the West End, and the new 50-hp. hoist is working smoothly.—The shipments of ore from Tonopah during the week ending Sept. 12, over the Tonopah & Goldfield railroad, as reported by the Western Ore Purchasing Co., were as follows: Tonopah Mining Co. to smelter, 663 tons; to Virginia mill, 448 tons; to Desert mill, 2,800; Belmont, to Belmont mill, 1,390; Midway, to smelter, 202; Montana-Tonopah, to smelter, 36; Jim Butler, to smelter, 103. Total, 5,702 tons. Goldfield-Mohawk, 27 tons; the Kendall-Douglass of Manhattan, 11 tons.

OREGON.

BAKER COUNTY.

The smelter at Sumpter has closed down after a successful run. The furnaces could have been kept going longer if ore contracted for had been hauled from Susanville to Austin; proper fluxes were not on hand in sufficient quantity for a longer run. Good shipments were made from the Imperial and California.—The Worley mine in the Greenhorns has been examined by John J. Munzer, a mine operator from Pittsburg, for W. P. Killen and associates.—The Golden Chariot mine, operated by the Orleans G. M. Co., has been closed temporarily on account of lack of funds.—The new Present Need mill in the Quartzburg district is running.—Ray & Krouse have bonded a group of claims in New Eldorado to Eastern people.—The affairs of the Midway mine will be adjusted in the courts.—L. G. Lilley has received orders from Cincinnati to start work on the Last Chance property.—A contract has been let to run a raise from the lower tunnel to the upper workings of the Morning mine in the Greenhorns, by W. F. Butcher and Peter Basche.

SOUTH DAKOTA.

LAWRENCE COUNTY.

The Washington Consolidated ground in the Galena district has been examined by George Houston and J. T. Flint, and it is thought that the property will be purchased by a syndicate of Duluth men. The ore carries lead, zinc, and iron; the property consists of 80 acres, and has been opened by tunnels and shafts. The new owners will run a 700-ft. tunnel to cut several dikes, and will sink a 600-ft. winze at the breast. The same people are negotiating for the Richmond and Sitting Bull properties, which adjoin the Washington Consolidated.—The Branch Mint mill, near Galena, will be started before October 1. This plant will have a daily capacity of 800 tons, with 120 stamps and a slime plant. The ore is said to average \$4 per ton, and will be crushed in cyanide solution. This is



Map of the New Mining Districts of Nevada and California.

Mohawk Jumbo, a raise has been started on the vein cut 70 ft. east of the shaft on the 500-ft. level. The mine is producing about 100 tons of ore per day.

NYE COUNTY.

(Special Correspondence).—The Mayflower Consolidated Co. has reached the 400-ft. point in the main shaft and sinking is being continued. The management reports the vein cut at that level, and states that it still consists of a grade of good milling ore. The shaft is sunk on an incline of 65°. On the 100-ft. level, 90 ft. of lateral work was done; 325 ft. on the 200; 200 ft. on the 300 level, and 30 on the 400-ft. level. This mine is one of the best equipped in the district. A 12-drill, belt-driven, 100-hp. compressor was recently installed. Hoisting is done by means of a 25-hp. gasoline engine. The mine buildings are all substantial structures, including two large bunk-houses, boarding-house, assay office, and superintendent's office. Plans are under way for a 50-ton mill, the water for which will be piped from the Amargosa river, two miles distant, where the company has water-rights. The officers of the Mayflower-Bullfrog Consolidated M. Co. are: W. A. Stevens, president; John T. Overbury, treasurer; Chas. F. Ryan, and A. C. Eisen.—Adjoining the Mayflower is the Croesus, on which a shaft is being sunk to tap the Mayflower vein. At present writing the same has reached a depth of 310 ft. No lateral work will be done until the 500

the largest cyanide mill in the Black Hills that crushes its ore in the same plant with the leaching apparatus. James D. Hardin is superintendent.—The Minnesota mill, near Garden City, with a capacity of 200 tons per day, will soon be running. The machinery is all on the ground, with the exception of the compressor and filter-press. F. E. Little of Minneapolis is the president.

PENNINGTON COUNTY.

The strike at the Jo Dollar mine, west of Keystone, and managed by G. A. Carr, is awakening interest in that district, where the Niagara, Deep Down, and Golden Slipper companies are also working.—The spodumene mine south of Keystone has made several shipments to New Jersey.—The water in the Holy Terror mine has been kept at No. 4 level with bailing skips, and the shaft is being retimbered.—The new air-compressor for the Dorothy and Pettigrew tunnels will soon be in operation.—Thure Swanson has bonded his claims to Eastern parties.—The new steam-plant and air-compressor at the Mariposa mine on Slate creek, near Mystic, are in operation, and the main tunnel has been driven 650 ft. John Wise is the superintendent.—Work may be resumed at the Gertie tin mine at Hill City, under the direction of E. C. Johnson. A small quantity of tin from the mine was marketed last fall.—About eight men are employed in prospecting at the Gold Bug No. 1 claim, under Everest Palmer.

WASHINGTON.

FERRY COUNTY.

(Special Correspondence).—At the Copper Key mine the cross-cut from the No. 2 adit has intersected the orebody for nearly 80 ft. The ore is changing from iron sulphide to quartz, which leads to the impression that the hanging wall is near.—Another vein has been cut in the new adit on the Oversight group. The ore carries smallite.—Several cars of ore from the Winnipeg mine are on the Belcher Mountain railway siding, awaiting shipment to the smelter.—The Belcher Mining Co. has brought suit in the Superior court of Ferry county against J. L. Harper, its former superintendent, to quiet title to the Hidden Treasure, Nazarine, and Nondescript claims, which adjoin the Belcher claim of this company.

Republic, Sept. 10.

BRITISH COLUMBIA.

Three furnaces at Le Roi smelter have started, after a shut-down of about a month. Fuel enough is available now for a rather long run. The Rossland mines produced as follows during the week ending September 7: Centre Star, 3,030 tons; Le Roi, 1,020; Le Roi No. 2, 350 tons of ore. Total, 4,400 tons.—The Idaho shaft is down 100 ft. and will be continued, to connect with a drift from the 400-ft. level of the Centre Star. A large tonnage of ore is being blocked out by development work in the Iron Mask, Centre Star, and War Eagle.—During the last few days, 70 men have been added to Le Roi force, and regular shipments to the Northport smelter will be resumed at once. Diamond-drilling continues on the Splitzee, and the development of the 1,650-ft. level is progressing.—Alexander Hill, consulting engineer for Le Roi No. 2, has been inspecting the property, and will examine the Vancouver mine, near Silverton, which the company is working.—No shipments were made from the White Bear during the week, but development continues.—A sawmill will be erected at the Inland Empire, to supply lumber for the new buildings and the 10-stamp mill that the company will build.—A small force of men is employed at the Jumbo.—Lessees continue to produce a little ore from the Nest Egg property.

During the week the Consolidated smelter at Trail received 4,848 tons of ore. In addition to the Rossland mines, the following contributed: Silver King, Nelson, 159 tons; Victoria, Nelson, 83; St. Eugene, Moyie, 170; Whitewater, Ainsworth, 161; North Star, East Kootenay, 133; Rambler-Cariboo, Slocan, 45; Standard, 26; Arlington, Slocan, 25; Queen, Salmo, 23; Arlington, Eric, 22 tons.—The Boundary shipments were as follows: To Granby smelter from Granby mines, 12,119 tons; from Emma, 440 tons. To B. C.

Copper Co.'s smelter from Mother Lode, 2,621 tons; from Snowshoe, 1,750; from Oro Denoro, 60 tons. To Dominion Copper Co.'s smelter from Brooklyn, 820 tons; from Idaho, 896; from Rawhide, 2,339; from Sunset, 875 tons. To Trail smelter from Snowshoe, 1,365; from Providence, 30 tons. Total ore shipments for week, 23,285 tons, and for year to date, 811,178 tons.—Boundary smelters treated this week as follows: Granby smelter, 11,559 tons; B. C. Copper Co.'s smelter, 6,635; Dominion Copper Co.'s smelter, 4,930 tons. Total for week, 23,124 tons. Total for year to date, 797,420 tons.

At a recent meeting in New York, of the shareholders of the Granby Consolidated, the regular quarterly dividend of 3% was declared on the outstanding shares of the company. There are 135,000 shares issued, at a par value of \$100 each, making this dividend amount to \$405,000. This makes a total of \$3,000,000 in dividends paid by the company.—E. N. Ouimet, of the Referendum Mining Co., reports that the quartz mill is now in operation at that property. In the recent discovery in Burnt basin, on the Yankee Boy group of claims, several open-cuts are being run on the vein.

MEXICO.

JALISCO.

A wagon-road will be built from the Pacific port of Las Peñas to the mining town of San Sebastian, where the Navidad M. & R. Co., managed by J. F. Buel, is operating. This company contracted to purchase the properties of the Jalisco Mining Co., for \$350,000, including a reduction plant and 13 mines. The Quiteria mine is being worked, and the others are being reopened. Air-drills will soon be in use, and a 200-ton cyanide plant will probably be built.—The 30-ton mill of the Ayutla Mining Co. will be in operation within a month. The crushing is done in a Blake crusher and two sets of rolls. The heaviest stockholders are A. W. Geist, A. H. Brewer, and E. G. Coffman, and they also control the San Felipe, Vesuvio, and Zapatero mines.—The Real Alto M. Co., of Philadelphia, which was promoted by H. H. Cross, is employing 50 men in the San Sebastian district. The company owns the Peña Rejada, Las Cruces, and Santiago mines. H. W. Young is the superintendent.—The custom smelter of the Carrizo Copper Co. will be erected just north of the town of Ayutla. The company owns 40 acres.

SONORA.

The new furnace at the Verde Grande mine, 40 miles northwest from Hermosillo, will be blown in soon.—J. R. Hendra reports that he has a promising copper property 20 miles northeast from Alamos.—About 200 tons of graphite per month is mined at the Dewey mine, 16 miles southeast from Hermosillo. The product is sold in Pennsylvania.—The Quintera Mining Co. has struck silver-lead ore at a depth of 300 ft., at Minas Nuevas.—Seaman & Gustausson are developing cobalt ore in the Alamos district.—The Creston de Cobre Co. is developing a promising copper property 40 miles west of Hermosillo. The shaft is down 100 ft., 15 men are employed, and I. F. Wiles, of Los Angeles, is the general manager.—Work has been resumed and the mill is again running at the San Ricardo mine, near the San Miguel river, in the Ures district, north of Opodepe. Thomas F. Turner, of Canton, Ohio, is president of the company.—Charles Eddy reports finding a good prospect of gold and silver ore east of Alamos, and near the Chihuahua line.—A party of Los Angeles men is visiting the Eliza E. mine, 14 miles east of Alamos.—Peter Scott is developing a lead-silver property nine miles from Navajo, in the Alamos district.—L. H. Jensen, of Kansas City, is manager for the Llano Copper Co.—F. G. Forshaw is the superintendent of the Las Góteras mines, near La Barranca, in the San Javier district.—D. A. Moreno, of Santa Ana, will sell his Cerro Colorado mine in the Altar district to Pennsylvania capitalists.—Good progress is being made in the Santa Rosa mine, south of Douglas, which was taken over by the Caballona Development Co. The property was once owned by James Kirk, of Cananea, but was bonded by Thomas H. Collins. The old work consisted of a 260-ft. shaft, with a 50-ft. drift on the 200 level. Ed. McFarland is the superintendent.

Special Correspondence.

Johannesburg, Transvaal.

Output for July.—An Increase.—Details of Production.—Mining for Base Metals.—Diamond Syndicates.—The Chinese Labor Problem.—Local Manufacture of Cyanide.

The returns for July, which have just been published, show that the industry has returned to the pre-strike basis. The total output for the Transvaal in July was 532,711 oz. valued at £2,262,813, of which the Rand contributed 513,655 oz., valued at £2,181,867. The output of gold from the Rand shows an increase over June of 25,699 oz. During July there were 8,580 stamps at work in the Transvaal, of which 8,220 were crushing on the Rand. To show the value of the July output relative to the other months of this year, the following table is given:

January, 1907	537,638 oz. valued at £2,283,741
February "	493,642 " " " 2,096,434
March "	538,497 " " " 2,287,391
April "	537,019 " " " 2,281,110
May "	524,477 " " " 2,227,638
June "	507,599 " " " 2,155,976
July "	532,711 " " " 2,262,813

As usual, the Robinson mine was the premier producer in July, with an output of 22,814 oz. valued at £96,908, while the Simmer & Jack was second with an output of 22,435 oz. valued at £95,298. During the strike many of the mines sorted out much less waste rock than usual, in order to keep the mills at work, but in July the amount of waste rock discarded was normal again.

The Luipaard's Vlei Estate mine shows far and away the highest crushing duty per stamp per 24 hours, namely 8.5 tons, while the lowest recorded duty was that of the Windsor mine with 3.56 tons per 24 hours. Quite a number of mines show a duty of seven tons and over. Tube-mills are responsible for this high stamp duty. As regards labor, the figures show that during July there were 7,592 natives recruited, while 8,146 Kaffirs left the Rand. The Chinese figures show that the total laborers in South Africa available for mines on July 31, 1907, were 51,441.

It is of interest to note that the Messina Copper Co. declared an output of 150 tons of copper glance in July, assaying 60.49% metallic copper. A prospect called Campbell's Mercury made a rather encouraging report as regards mercury. Several parties are doing some work, in a small way, on silver-lead properties. Altogether quite a lot of quiet work is being done in the Transvaal on the base metals.

Diamond syndicates are as popular in these hard times as ever. In fact, the only way to raise any money just now is to get up a diamond syndicate. It does not matter much where it is situated, at the centre of the earth, or on the moon, just so long as the magic word 'diamond' appears. Men who have only £100 or so left in the world, would not dream of placing it in a sound business investment, where they can obtain 5% interest, but they will put every penny of it in a diamond syndicate in the vain hope that their money will increase ten fold.

There has been a plethora of rumors on the Rand during the past fortnight, on the subject of the fate of Chinese labor. One day we are told that the coolies must go, and the next that the Government is so worried over the scarcity of native labor that they will allow the coolies to remain. There seems to be little doubt that the Botha ministry are at their wits' ends in regard to the labor problem. Probably they themselves do not know for

certain what will be the outcome. The Boers are opportunists, and at the last moment, they would readily take the line of least resistance, and give the order "right about, turn" as regards the Chinese question. According to the constitution, the present Chinese ordinance becomes null and void next March. At that date, unless new legislation supervenes, every Chinaman on the Rand will be free to do as he pleases. But the Government has hurriedly brought in a bill to allow the coolies whose contracts remain unfinished next March to work out their indentures. This means that the last Chinaman will not leave the Transvaal before 1910. The chances are that the 17,000 coolies due to leave the Rand this year will go. What will happen next year, no one knows. One of the greatest opponents of Chinese labor is J. B. Robinson, controller of the Randfontein group of mines. This month nearly 2,000 coolies employed on one of his mines are due to leave the Rand. To the surprise of every one, this anti-Chinese champion has anxiously inquired if his coolies can sign on for three years more, and has sent in a pleading petition from the Chinamen, asking leave to remain at work in the Transvaal. This is a sample of the double-faced way in which the campaign against the Chinese has been carried on.

Considerable interest was excited last week by the



Map of South Africa.

announcement in the daily press that a company, the South African Cyanide Co., Ltd., had been formed with a capital of £50,000 for the purpose of manufacturing sodium, potassium, and magnesium cyanide, as well as soda crystals, bi-carbonate of soda, and other products, all of which are at present imported into the colony. Contracts have already been entered into for the supply of 80% of the cyanide used in the Transvaal, subject, of course, to the condition that the article be up to the standard of the imported chemical. At the present time Germany supplies almost all of the cyanide used on the Rand. The German article is subject to a duty of 3%, while the British article is allowed in free. The price of potassium cyanide delivered on the Rand is about £70 per ton, and of sodium cyanide about £90 to £100 per ton. The monthly consumption of cyanide is about 400 tons per month. It is to be hoped that something will come of the new enterprise, and that it will not go under, as so many industrial enterprises have done in this country. The press has given the South African Cyanide Co. a fine puff, for like everyone else, they want to see industries started in this country. Whether the chemicals made by the new company can compete with the excellent stuff sent here from Germany remains to be seen.

Denver, Colorado.

American Mining Congress.—A Lucky Landslide.—New Cyanide Mills. Durango Smelter.—Telluride Ores.

The American Mining Congress seems to be thoroughly imbued with the prospector's spirit. Its old men see visions and its young men dream dreams. Among the latter is the proposal to get from Federal sources the funds to construct a "million dollar mining temple" in Denver. In the temple there is to be a staff as nearly like that of an agricultural experiment station as the nature of the two industries permits. That such an institution could have any value commensurate with the expense of its maintenance appears extremely doubtful. Indeed the projects of the Mining Congress generally seem to be tinged more with rosy optimism than with common sense. One of its pet projects is to secure the creation of a Department of Mining in the Cabinet at Washington, on the basis that as mining and agriculture are the two fundamental industries, therefore there should be a department of mining as well as of agriculture. How absurd this appears when we reflect that the value of the annual production of such an inconspicuous thing as hen's eggs alone exceeds the annual production of any single metal, excepting iron and gold, and several single crops each exceed in value the total annual production of all metals combined. It is not minimizing the value of the mining industry to say this, but simply regarding relative values in a sane way.

Some men are born rich, some acquire riches, and others have riches thrust upon them. A case in point occurred the other day between Leadville and Breckenridge, where some people have for a time been prosecuting development work on a claim near the top of Mount Sheridan, but without any marked success. The other day a landslide occurred near their workings, leaving exposed a vein six feet wide that is reported to assay \$150 per ton. Now if some inventive genius will only devise a method of producing landslides at will, a cheap and convenient method of prospecting will be available for everyone.—The Yak Tunnel has secured a second shaft connection by the breaking through of the M. N. shaft to the tunnel level. The Yak is also engaged in developing near-by properties that do not connect with the tunnel-level.

The number of cyanide mills under construction or proposed in the Cripple Creek district increases daily. The latest is a mill of 100 tons per day capacity to be built at the mouth of the Good Will tunnel, near the edge of the town.

Considerable quantities of oxidized ore are exposed in the tunnel, and it is for the treatment of these that the plant is to be erected. That part of the Golden Cycle mill that was not destroyed by the fire is now engaged in treating the material accumulated on the tailing dump of the old Telluride company. Judging from the rate at which the work of reconstruction is progressing, the plant will not be immediately rebuilt. The Portland and Standard mills are running full capacity, and are treating the larger part of the tonnage formerly handled by the Golden Cycle.

Rumors are afloat that the capacity of the Durango plant of the A. S. & R. Co. is to be largely increased. The present equipment of roasters and kettles for the H. & H. process is to be nearly doubled, and possibly another blast-furnace may be added. The smelter of the Ross Mining & Milling Co., at Silverton, which apparently had been conducting a successful campaign, has closed for the present, and no definite announcement is made as to reopening. A prominent shipper to the Durango plant is the newly-developed May Day, near Hesperus, which while contributing ore to the smelter also contributes not

a little to its problems; for the ore consists of tellurides of gold and silver in a gangue of quartz and a highly aluminous clay that is not at all easy to flux. Cripple Creek is generally thought of as the only place in this country where tellurides are of much importance, but when one stops to count them up, the number of mines throughout the State where the gold and silver are contained in tellurides is surprisingly large.

Butte, Montana.

Effect of Copper Decline.—Curtailling the Output.—Exaggerated Rumors.—Remarks of John Gillie.—North Butte Discovery.—Important Development.

The Amalgamated and associated mining companies have no present intention to shut down their mines, notwithstanding a report to the contrary from New York and Boston, but a policy of curtailment and retrenchment, inaugurated several weeks ago, is being carried out, and the September output of copper will show a diminution of fully 40%. That policy is to be continued



Montana.

until the curtailment amounts to at least 60% of the normal production. The purpose is, as is well known, to avoid a great storage of copper and keep down the production until the consumption of the metal catches up with the output. The curtailment during the past month has not, however, been due entirely to the copper situation, the strike of machinists in Butte having been in part responsible, the strike necessitating the closing of some of the mines.

The policy of retrenchment is not confined to the Amalgamated, but will be followed by other mining companies in Butte, including the North Butte, Coalition, and Pittsburg & Montana. While the curtailment of the copper production of these companies will amount for the present to fully 60%, the force of miners will not be reduced to the same degree, as the fixed crews at the different mines will have to be retained whether the production is 10 or 90%. However, there will be a decided reduction in the working force at all of the mines, and many men are being laid off. In addition to the general reduction of the working forces, mining will be entirely suspended on Sundays, and all construction work at the mines and smelters will be stopped. Extensive development work and shaft-sinking will cease, with the exception of the sinking at the Badger State and Greenleaf mines of the Boston & Montana Co. Work on the new head-frame at the Pennsylvania mine will continue, but the work on the ore-bins at the Penn-

sylvania, West Gray Rock, and Buffalo has been ordered suspended. At the Belmont mine the work of enlarging and re-timbering the shaft has been stopped, and operating expenses will be cut wherever possible, but every effort will be made to avert the necessity of a general shut-down.

The normal production of the Amalgamated companies is about 20,000,000 lb. copper per month, but this will be reduced to at least 7,000,000 or 8,000,000 lb. This curtailment is being brought about gradually, but has been going on for several weeks. The orders for the suspension of Sunday work, as well as construction and development, have been given by the general superintendent, Mr. John Gillie. The main reason for it is the gradual accumulation of copper and the absence of adequate buying by manufacturers. It is considered poor management to mine copper and store it, without even the present prospects of getting mining costs out of it. Notwithstanding the fact that consumers have not a large supply of metal on hand they are not buying copper, except in quantities sufficient to meet requirements from week to week. They must have knowledge of the fact that the producers are accumulating the metal, and are satisfied to have it accumulate in the hands of the producers rather than on their own while the price of the metal is so uncertain.

"Conditions are unnatural," said Mr. Gillie in discussing the situation. "Manufacturers are running their plants just as usual, and the whole country is prosperous. The railroads are doing 40% more business than they did a year ago. The iron and steel business is good, and the farmers certainly are prosperous. The only complaint the farmers have is that they cannot get men enough to harvest their crops. Conditions in the copper business must improve, but when the change will come no one can predict. Consumers evidently do not believe that the bottom has yet been reached, and they are buying metal only in small lots. When they are satisfied that the bottom has been reached they will buy in 10,000,000 lb. lots instead of 100,000 lb. lots, as they are doing now. But in the meanwhile the producers have their money tied up in the surplus stock, and a curtailment of production has become necessary." Mr. Gillie added that the only advantage to Butte that would come out of the curtailment would be a relief to the fuel situation, as it would probably avert a coal famine. The companies will, of course, use a correspondingly less amount of coal, which will be diverted to the commercial trade.

One day last week when North Butte copper shares sold at \$48, and stockholders thought the bottom had been reached, a report came from the mines of the company of an important development, the discovery of a big and exceedingly rich orebody, the announcement of which under ordinary conditions would have sent North Butte stock skyward. The new orebody developed is in the west drift of the Edith May on the 1,800-ft. level. The drift has been extended 500 ft. west from the cross-cut and for 200 ft. the ore has been especially good, improving with every foot of advancement. In the face of the drift the orebody is 26 ft. wide, and assays give an average of 12% copper for the entire width. The ore is glance and bornite. The orebody is much larger and better than it is vertically overhead on the 1,600, and better than the manager, A. C. Carson, had expected to find. The west 1,600 drift is about 400 ft. further ahead than the drift on the 1,800 and the ore has been improving as the drift has progressed westward. If the same condition is found on the 1,800, as promises to be the case, the vein at that depth is likely to develop into a bonanza. The company is also driving the 1,800 cross-cut for the Jessie vein, lying north of the Edith May, and the opening is now

about 150 ft. beyond the Edith May vein. Early in October sinking will be resumed on the main shaft, which is now 1,900 ft. deep, and 200 ft. will be added. At 2,000 ft. stations will be cut and the veins then explored at that depth. It is expected that the addition to the shaft and the stations will be completed by the first of the year.

Deadwood, South Dakota.

New Mills Started.—Mica Mining at Custer.—The Victoria Co.—Repairing the Homestake Shafts.—Renovating Old Mills.—The Branch Mint.—Theft of Precipitate.

Within the next ten days it is expected that the new mill of the Saginaw Gold Mining Co., at Custer, will be placed in commission. This is a mill constructed along new lines and is a decided departure from the ordinary Black Hills practice, and for that reason its operation will be closely watched. The ore is a typical quartz, carrying gold in a free state and in pyrite. After the usual preliminary crushing in rock-breakers the ore will be reduced in McCullough pulverizers, a machine constructed similar to the ordinary rolls, but differing from them in that the side of the shell, rather than the face, is used in crushing. The sides or crushing faces are trimmed off at an angle of about 30° from the side of the shell. A different speed is maintained on each so-called disc, and by this means a combined crushing and pulverizing action is secured. Among the important claims made for this machine is that the shells wear smoothly and absolutely free from corrugations. Peculiar boxes are used to take care of the end-thrust, and high crushing duty is claimed. I. W. Herber is president and manager.—The Ivanhoe Gold Mining Co., also at Custer, has authorized the construction of an up-to-date amalgamation and cyanide plant; work has already started on the foundations. The company has done a large amount of development, opening orebodies that fully warrant the mill equipment, and has thoroughly tested the ore in a small mill, which has been in operation intermittently for nearly two years. H. F. Ratte is manager.

The mica mining industry of Custer has received an impetus within the past year through the purchase, by the Westinghouse Electric & Mfg. Co., of several groups of claims. One of these, the New York, has been equipped with machinery and a steady production is being maintained. Twenty to 30 miners are employed. The mica is hauled to Custer from the mine, and there sorted and prepared for shipment by girls and young women. About 50 operatives are here employed. The company has been continually adding to its property holdings and only recently made a \$5,000 purchase from McGonigal & Beatty.

The Victoria company, in the Ragged Top district, near Deadwood, has recently started its new mill, and is rapidly bringing the plant up to the maximum tonnage—250 tons daily. The ore, which is an altered and mineralized Carboniferous limestone, is treated by the dry-crushing cyanide process. Under the management of F. E. Steele, a graduate of the South Dakota School of Mines, a good recovery and most satisfactory results are being obtained. The ore averages a little better than \$4 per ton. The Victoria-Extension, owned and managed by practically the same parties, is shipping smelting ore from the Ulster claim.—The Echo Gold Mining Co. is putting in a plant of electrically driven machinery and will shortly begin deep mining. This company owns an acreage in the Maitland district, four miles from Deadwood, and has confined itself to tunnel work in the past. The plans now include sinking a deep shaft to exploit the

veins opened near the surface, from several of which gratifying assays have been returned.

The repairing of the damage caused by the fire at the Homestake is well in hand, with a large force of men. Workmen are now employed on the pumps on the 1,100-ft. level of the Ellison, overhauling them and cleaning up the rubbish that accumulated from the flooding. Within a few days the pumps will be in running order and then short work will be made of dewatering the remaining 450 ft. of this shaft. Stopes and workings on these lower levels are not as extensive as above, and it may be said that the mine is about four-fifths unwatered. The Star shaft, the nearest opening to the region damaged by fire, was injured by caves and thrown considerably out of line. After six weeks of work this damage has now been fully repaired, and a crew is employed straightening and level-

on the outskirts of Deadwood, was found a gasoline furnace and complete rig for turning the precipitate into marketable bullion. Detectives are now at work and it is probable that further startling disclosures concerning this and other plants will be made in the near future.

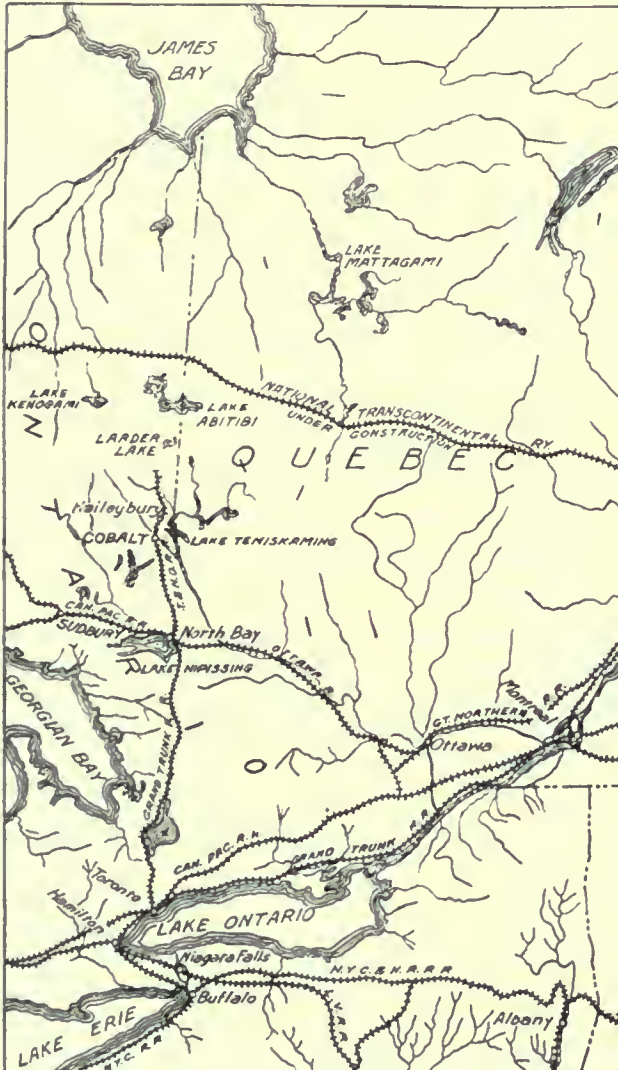
Toronto, Canada.

The Crow's Nest Coalfield and the Granby Copper Co.—The Guggenheim's Concession.—Ore Shipments From Cobalt.—New Discoveries.—Strikers in Court.

Reports having been circulated respecting the securing by J. J. Hill, the Great Northern Railroad magnate, of a controlling interest in the Crow's Nest Pass Coal Co. by the purchase of large holdings of Toronto shareholders, and Robert Jaffray, a vice-president, has given out a specific statement of the relations of Mr. Hill and the company, characterizing the current reports as untrue. While denying that Mr. Hill has secured a controlling interest, or bought out Toronto stockholders, he states that the Granby Copper Co. of Grand Forks, B. C., which is naturally interested in the Crow's Nest Pass operations, as it is the largest consumer of coke in the Province, has recently purchased a large block of Crow's Nest stock, paying for it about \$700,000. The Granby Co. and Mr. Hill have in addition put a good deal of money into the treasury of the Crow's Nest Co. for the enlargement of its operations. The present output is about 3,500 tons of coal per day, and with the additional capital secured it is intended to increase the output as soon as possible to 7,000 tons daily and ultimately to 10,000 tons. As soon as the Granby Copper Co. can rely on a daily supply of 1,200 tons of coke, equivalent to 2,000 tons of coal, they will double their capacity for the treatment of ore. There has been no question of control and there is no feud between parties in the Crow's Nest Pass directorate. Manager Lindsey retains his position with the full confidence of the board and of Mr. Hill.

A committee has been appointed by the Yukon Territory legislature to memorialize the Canadian Government regarding the Boyle concession in the Klondike camp; this covers 40 square miles and is partly owned by the Guggenheims. An investigation as to how the concession was acquired and the terms on which it is held is asked for.—A party of about sixteen English journalists representing leading daily and financial newspapers has arrived in Ontario, on the invitation of the Government, to inspect the mineral resources of the Province. They will leave Toronto on the 16th and visit all the important mining centres of northern Ontario.

Shipments of Cobalt ore for the week ending September 7 amounted to 162 tons from the following companies: Buffalo, 30; Coniagas, 125; La Rose, 40; and Nova Scotia, 30 tons. Men engaged in grading on the Kerr Lake branch of the Temiskaming & Northern Ontario Railway unearthed a cobalt vein yielding from 800 to 1,000 oz. per ton of silver on the Kerr Lake or Jacobs property. A cobalt vein 4 ft. wide has been found at the Temiskaming & Hudson Bay mine. It will be tapped by cross-cutting from the main shaft, which is now down 80 ft. Two 80-hp. boilers and a 16-drill compressor are being installed. The Ruby Silver Mining Co., in Bucke township, has installed a small steam plant and drill. The main shaft is down 40 ft. on four veins, all of which show good silver contents. Willet G. Miller, Provincial Geologist, who has been inspecting some of the newer finds, states that most of the discoveries in James township are in diabase. At Silver lake, five miles west of Bear creek, on Montreal river, native



A Part of Ontario, Canada.

ing up the shaft-house. The Homestake has commenced the rebuilding and renovation of its older mills, those which have been in continuous operation for 25 years or more. Old mortar-blocks, battery-posts, etc., that have withstood wear for a quarter of a century, are being replaced with new timbers. The work is being undertaken in a leisurely way, ten stamps being hung up at a time.

E. M. Hilton is in the Lawrence county jail at Deadwood, charged with the theft of precipitate from the zinc-boxes of the Golden Reward Co. After his arrest Hilton broke down and made a full confession, acknowledging his guilt and implicating F. L. Thorpe, a Lead City jeweler as the purchaser of the gold. Thorpe was arrested but released on \$1,000 bonds. Hilton had been systematically stealing from the zinc-boxes, and at his house,

silver has been found and many claims staked. One vein near Silver lake was 7 in. wide with the silver well distributed.

The Cobalt strike promoters are now before the courts, their prosecution for the infringement of the Industrial Disputes Investigation Act having been undertaken by the Provincial Government. Under the provision of this act, passed a few months ago, striking is illegal in connection with the mining industry, unless a Government investigation of the dispute has first been held. James McGuire, president of the Cobalt Miners' Union, affiliated with the Western Federation of Miners, was found guilty by a local magistrate and fined \$500 and costs or two months in jail. An appeal was taken and McGuire was released on bail.

Mexico City.

Heinze and El Potosi.—Rumors of a Sale.—Important, if True.—Old Days in Santa Eulalia.

Persistent rumors come from Chihuahua to the effect that F. Augustus Heinze is after the El Potosi mine, in the Santa Eulalia district and near the city of Chihuahua, but that he is waiting the decision of the Mexican Supreme Court on the Dolores case, which was mentioned in the columns of the MINING AND SCIENTIFIC PRESS a few weeks ago, before he acquires larger interests in that part. The El Potosi Mining Co. is a subsidiary company of the Chihuahua Mining Co., which is controlled by Grant B. Schley, of Moore & Schley, Dennis Sullivan, and others closely allied to the Standard Oil Co. The names, therefore of the principal stockholders makes such a deal as reported seem most improbable, though it is true that E. H. Wilson, of Butte, and W. Zeigler, J. W. Kingsbury, and E. M. Norris, of Salt Lake City, have just left Santa Eulalia after several weeks spent in a general examination. The Potosi is reported by many to be the greatest silver-lead mine in the world and over 1,000,000 tons of high-grade ore are supposed to be blocked out. The negotiations are said to include the properties of the Chihuahua Mining Co. in Santa Eulalia, and the figures are in the neighborhood of \$100,000,000. But, as stated above, it is most improbable that Mr. Heinze will invest more capital in Santa Eulalia or elsewhere in the Republic until he learns of the interpretation of Mexican justice to be rendered in the Dolores case, which is being fought by his representative, J. P. Hutchinson. The interests that control the Chihuahua Mining Co. are practically identical with those controlling the Chihuahua & Pacific Railroad (which will probably eventually become part of the Kansas City, Mexico, & Orient system) and the Calera Mining Co. at Miñaca, which is said to be the largest zinc mine in the world. C. M. Pringle is in charge of the latter property and has just completed the installation of a Sutton-Steele dry table, and the plant will be further increased if it continues to be successful.

C. R. Hughes, manager for the Sacrificio Mines Co., twenty miles from Nombre de Dios in the State of Durango, is quoted as saying that a deal has been carried through by Alpine & Williams for the sale of the Verde mines in the Parilla district to New York people for \$120,000. He states further that the old Vacas mines in the same district are soon to resume operations. These mines, though having good bodies of disseminated galena ore, a well equipped concentrating plant with the old southeast Missouri jigs and a three-stack smelting plant, have done very little since the spring of 1895, when Wm. J. Grace and his mother, of Rochester, New York, appeared upon the scene and in some way acquired control of the property, with the result that it has been in

litigation ever since. Within the last five years the mines were examined by Walter S. Kelley, and it was thought they were to be started up, and even more recently B. Clark Wheeler was supposed to have obtained a lease and bond on the property, but always there seemed to be some hitch. Certainly it is to be hoped that matters have at last been straightened out and that there will soon again be the activity of 12 or 15 years ago. But there will not now be the same excitement in disposing of the product as there was then, when the lead bullion was refined in a Mexican *vaso* (or cupel furnace) and the resulting silver buried until there was sufficient for shipment, when superintendent Brittan, without advising anyone, would skip out in his two-wheeled cart, made especially heavy with an iron compartment under the seat, with a heavy guard, and by leaving early in the morning at or before daylight, so as not to be seen, Durango could be reached before night. This was made necessary by reason of the region through which they had to pass, the little settlement of La Parilla being famous as a rendezvous for the most noted bandits in the State of Durango, and more than one cross used to stand along the road between Vacas and Durango to mark the spots where guard or attacking party had been picked off. But repeated Government raids on La Parilla cleaned out that place and it is now a peaceful little town, so that only a long stretch of lava flow about midway between Vacas and Durango gives one the right in the present day to speak of the trip as one through the 'bad lands.'

Morenci, Arizona.

Arizona Copper Co.—Mining in the Carlisle District.—The Lone Star District.—Good Work at the Shannon.—Talk of Consolidation.—Accidents on Inclines.—Patagonia.—The San Carlos Strip.—Old Discoveries Revived.

The output of the Arizona Copper Co. for the past month shows a decrease from the usual average, being but 1,177 tons of converter copper. The shortage, however, was caused by the strike of the smeltermen early in the month, and by the heavy rains that came later, filling the flume with mud and debris, thereby cutting off the water supply. However, it is stated that everything is in good order and the usual amount of copper is being made. Some good ore is being shipped to the Shannon smelter by F. H. Perry, of the Carlisle district.—Pat Crowley, one of the old-time prospectors of this district, in company with Dan Fraser, has gone on a tour of inspection of the new Carlisle district. He has been interested in many of the mines, one of them being the Antietam, now belonging to the New England Co.

The New York-Arizona Gold & Copper Co. has been strengthened by the appointment of Charles Allen as general manager. This company was recently organized to take over the Home Copper Co. properties, lying six miles northeast of Morenci. The property consists of the Buzzard's Shadow, the Lillian, and six other good claims, bounded on one side by the Gold Belt Development Co., and on the other by the Detroit Copper Mining Co. The Gold Belt people have moved their general offices and post-office address from Clifton to Morenci. There has been talk of the consolidation of the Arizona Copper Co. and the Shannon Copper Co, but this is not confirmed. In fact, everything points to the contrary. The Shannon for last month put out a little over 600 tons of converter copper, the plant being closed down six days for construction and repairs. The Minneapolis Steel & Machinery Co. has finished its contract with the Shannon people and is now engaged in finishing the machine-

shop at the Detroit concentrator at Morenci. The Shannon company has been averaging about 600 tons of converter copper per month, but in the near future an increase in operations and output will be made. The large new furnace is about completed, and this will take the excess ore supply that has been a cause of trouble in the past months. Old-timers in the district remember that the Shannon started when the price of copper was low, and that, with other troubles and obstructions, would have caused most ordinary properties to fail. Its real advancement did not commence until the present management (with J. W. Bennie as president-manager) took hold. Since Mr. Bennie's advent a smelter, concentrator, and many other necessary improvements have been added, and now the company has a smooth road ahead, with three 50-cent dividends already to its credit. Many of the smaller companies in this region are dependent upon the Shannon for the treatment of their ore.

The last month has witnessed two fatal accidents on inclines, one on the Shannon, the other on the Longfellow incline of the Arizona Copper Co. Both were caused by the breaking of the cable, and five men in all were killed, with two seriously injured, all being Mexican miners and timbermen.—Water in the Arizona Central mine is causing trouble to the Detroit Copper Co. This is the only mine of this company that is not entirely dry.—A meeting of the Arizona Gold Mines & Milling Co. has just been held, new officers elected, and arrangements perfected for further development. Frank Falke, of Fort Wayne, Ind., was re-elected president; Walter Lloyd, of Lincoln, Neb., vice-president; and J. J. Wyatt, secretary and manager. The property consists of a group of gold claims in the Patagonia district; a 5-stamp mill has been in successful operation for several months. This mill is to be increased to 15 stamps, the 1,000 ft. of development work showing sufficient pay-dirt to warrant the addition. The property is already equipped with pumps, engines, and buildings. The Dragoon holdings of this company embrace the Ryder and Swayzee gold group at South Pass. Several good lodes have been opened in these workings, and ore shipments have given satisfactory returns. The main shaft is down 125 ft., and it is the intention of the management to rush the work at this point.

A mining district in which a large number of Safford and Globe people are interested is that embraced in what is known as the San Carlos strip. About ten years ago, after repeated appeals from mining men, the Government opened to entry a large part of the San Carlos Indian reservation lying south and east of the Gila river. Later, another tract has been thrown open and many locations made. As a mineral area the strip has not been found wanting, but capital has been forthcoming. After ten years of exploitation in a desultory manner, the field is still unexplored. The earliest operations in prospecting met with adversities that few soldiers of fortune dared to face, and many who dared lost their lives in the undertaking. In 1892 two Germans, Jake Filleman and Fred Haas ran cattle in the Santa Teresa mountains on the east end of what is now the strip. Their log cabin still stands. It was known as the Dutch cabin for many years, and today it is surrounded by many cabins and tents that have become a part of the new Cobre Grande copper camp.

Filleman and Haas, during their cattle operations in these mountains, located a copper claim and sunk a shaft, but they were not altogether successful in their enterprise, either in developing ore or attracting the attention of mining men to the district. It became known as the Bocken shaft and no work was done in it for many years until last year, when Julius Riser, a Globe prospector, went into the district and discovered rich ore all along one side of the butte. Today there is an excellent prospect, and the old Bocken shaft is embraced in the group of claims known as the Cobre Grande. A. T. Hammons and A. G. Smith are the owners of this property. It is situated on the extreme west end of the porphyry zone in which the mineral is found. There are also a number of other claims. Close to Stanley Butte there is a group of claims that possess interest for the reason that their prod-



Map of Arizona.

uct of copper years ago assisted Dr. Flower, promoter of the gigantic fraud known as the Spenazuma swindle, in selling a million dollars of stock in his notorious Black Rock project. This group was then known as the Annie Rooney, and Dr. Flower sang her praises under the signature of 'Spenazuma.' The ore from this and other claims was packed to the Spenazuma workings and placed on the dumps to delight and allure the Eastern people who came to see the mine. The Annie Rooney is now one of the Cobre Verde group, owned by the San Carlos Development Co., whose directorate contains the names of many Globe men. W. C. Duncan is the general manager. The ore is found in the porphyry zone that traverses the district. The first shaft sunk follows the ore to a depth of 43 ft. The vein continues strong with a width of 3½ ft. The second shaft was sunk about 25 ft. east on a second vein and has reached a depth of 82 ft., and a cross-cut is being driven to determine the width of the ore below the point where the veins meet. Sinking will be continued.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

A 'DOUBLING-UP' piece is a timber used for reinforcing a set in bad ground. The term 'helper' is a synonym.

THE chief object in any plan of longwall workings is to have the permanent roadways the arteries of the system, providing the most direct route from all portions of the mine to the shaft.

THE best onyx used to come from the Pedrara quarries, near Puebla, Mexico. This source of supply is now exhausted, and small pieces of this choice stone are worth \$150 per cubic foot.

WHEN rock falls from the roof or sides of a stope, it is said to 'slough' or 'scale.' 'Slabbing' or 'sealing' of rock refers to large pieces, and 'sloughing' for the detachment of small fragments.

CALAVERITE, the telluride of gold, has been detected in some specimens from the Southern Lepanto district in the Phillipine Islands. This is the first authentic report of telluride ore in the Phillipines.

METALLIC copper, and not copper sulphate, is deposited on iron rails in the mines of Butte, by reducing action of the metallic iron on the sulphated waters of the mine draining through oxidized copper ore.

STROMEVERITE, a sulphide of copper and silver, has been found at Cobalt, Ontario. It has been found previously at Zacatecas, in Mexico, and in the Yankee Girl mine, at Red Mountain, Colorado. It is a mineral that characterizes a bonanza.

TO FIND the indicated horsepower developed by an engine, multiply together the mean effective pressure per square inch, the area of the piston, the length of the stroke, and the number of strokes per minute. This gives the work per minute in foot-pounds, and dividing the product by 33,000, we get a result which is the indicated horsepower of the engine.

THE longwall system of mining, especially as applied to coal, contemplates the extraction of the entire seam or bed, and the original significance was a continuous line of breast. After getting away from the shaft, and leaving a sufficient pillar to keep it open, no portion of the seam is allowed to remain. The method depends on producing a uniform and gradual settlement of the roof a few yards behind the working face. Pack walls are built on each side of the roadways and at regular intervals in the gob or waste area, and the roof settles firmly on these packs, pressing them into the bottom, or compressing them until the roof subsidence is complete. Longwall mining may be either advancing or retreating, with the shaft as a base.

TALC is found in nearly every State along the Atlantic slope, varying from pure foliated talc to harder steatite. Many of these deposits are favorably situated for transportation, so that it has been possible to work profitably many of the compact varieties of talc and soapstone in this portion of the country. In the Western States talc has been found in greater or less quantity at many points, but on account of their great distances from railroad transportation, only one or two of the deposits have been developed at all. In some instances nearly all of the talc

obtained from a certain State is used for one particular purpose, as that from New York, which is used almost exclusively as a filler in the manufacture of paper; and that from Virginia, which is manufactured into wash-tubs, laboratory sinks, stove-bricks, etc. The States that have produced talc or soapstone are California, Connecticut, Georgia, Maryland, Massachusetts, New Hampshire, New Jersey, New York, North Carolina, Pennsylvania, and Vermont, and most of these deposits have been described.

THE rare blue mineral identified in 1879 by Gonnard and named by him dumortierite, has been found at two localities on the Pacific Coast. One notable occurrence of dumortierite is at Clip, Yuma county, Arizona, where it so fills masses of quartz as to resemble lapis-lazuli, and at another point in Riverside county, California, it occurs in the same way, as fibres penetrating and coloring quartz. Within a few years dumortierite has been found in larger quantity and of a different tint in San Diego county, California, a few miles east of Dehesa, the place noted for its orbicular diorite. Here it appears in masses of several centimetres in either direction, with a radiating columnar structure and of a pinkish lavender color, instead of its usual indigo blue. It occurs intermingled with quartz in the lower half of a large dike, the upper half of which contains sillimanite, instead of dumortierite, similarly associated with quartz.

PORPHYRY is a general term applied to all porphyritic rocks. It is useful in describing texture or in a most general sort of classification, but is quite indefinite, and may mean any one of many widely differing rocks. The mineral constituents of porphyritic rocks are not of uniform size. There is a fine-grained or glassy portion called the groundmass, through which are sprinkled more or less perfect individual crystals of larger size, which are the phenocrysts or porphyritic crystals. Thus rhyolites, trachytes, dacites, andesites, basalts, diabases, granite-porphyrries, syenite-porphyrries, diorite-porphyrries, and gabbro-porphyrries may all be called 'porphyry,' although, strictly speaking, if the feldspar constituent is plagioclase, they should be called 'porphyrite.' The term 'porphyry' is loosely and colloquially used for almost every igneous rock in the West that occurs in sheets or dikes in connection with orebodies, and when so used, has but little significance.

THE uses of asbestos are many and constantly increasing. They depend primarily upon its fibrous character, but largely also upon its slow conduction of heat and electricity. As amphibole asbestos is less strong than chrysotile, the latter is the more valuable and useful, especially for products involving spinning. The amphibole asbestos is chiefly used in the manufacture of boiler lagging, steam-pipe covering, and insulating cements for general application. The best grade of chrysotile fiber is spun into thread, yarn, and rope, and woven into cloth. The yarn is largely used for packings and the cloth for theatre curtains, while fabrics containing asbestos woven with other fibres are made into various household articles in which heat-insulation is required rather than fire-proof qualities. It is extensively used for plastering and for making lumber that is employed throughout buildings, and especially on the roof, where insulation against fire and electricity are desired. Being a slow conductor of heat, its use contributes greatly to comfort and protection against extremes of heat and cold. Its application in fire-proof structures, and especially to envelop electrical conductors, is rapidly increasing, and the demand is said to be much greater than the supply.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

Green Gold.

The Editor :

Sir—In reply to your enquiry of last week as to whether I could throw any light upon the cause contributing the green tinge or color sometimes noticeable in the appearance of gold coin and bars, I have to say that I have never attempted to investigate the cause until your letter awakened an interest in the matter, although I was aware that the presence of silver in the alloy in making gold coins influenced the shades of color in the pieces when finished. In the sulphuric acid process of refining gold it was impracticable to remove all the silver where associated with crude gold, and as the Government permitted the presence of 10 parts of silver in a thousand in fine gold, or such gold as was acceptable for coinage purposes, very much of the gold coin contained silver, varying in amount from one to eight parts in a thousand according to the conditions under which the gold was refined. Of course, it must be understood that in the coinage operations this small amount of silver figured as part of the alloy, and that much less copper was used.

While I was satisfied that the silver was at least partly responsible for the green color of gold I thought the presence of copper in some proportion was also necessary.

Upon receipt of your letter I concluded to make some experiments in alloys that would determine the question. So with the aid of Mr. Sherman and Mr. Paek of the assay department we made eight melts, with varying arrangements of silver and copper alloy, which plainly showed that it was the silver and silver alone which gave gold bullion and coin the green color.

The following table shows the arrangement of the metals and the resultant effects in color after melting:

1.....	(900 gold) (10 silver) (90 copper)	No green apparent.
2.....	(880 gold) (20 silver) (100 copper)	No green apparent.
3.....	(900 gold) (5 silver) (95 copper)	No green apparent.
4.....	(700 gold) (300 silver)	Decided light shade of green.
5.....	(700 gold) (200 silver) (100 copper)	Faint shade of green.
6.....	(800 gold) (100 silver) (100 copper)	No green apparent.
7.....	(900 gold) (75 silver) (25 copper)	Tinge of green.
8.....	(900 gold) (100 silver)	Decided shade of green darker than No. 4.

As No. 1 and 2 were not unlike the proportion of the alloy used in gold coinage—in fact, that of No. 2 is a condition of alloy we have frequently had—I was surprised to find no trace of the greenish shade. This, and the result with No. 6, forced me to the conclusion that copper played no part in fixing the green color. Then why should the gold coins ever show the color, is a question that naturally follows. In contemplating the query myself, the answer followed the thought. It is this: Before the coin is struck or pressed the blanks are annealed—a process which requires heating the metal to a cherry red, causing the particles of copper in the surface of the coin to form the black oxide (CuO). As the oxide is quite soluble, the subsequent dropping of the metal into a diluted solution of acid removes all the copper from the surfaces of the blanks, leaving in place a film of pure gold alloyed with what silver happens to be

in the coin. Upon reaching this conclusion I took melts No. 1, 2, and 3 and treated the samples to the annealing process with the result that each then showed the green color. This color is stable, for it can be seen at times in gold coins of issue of forty years or more past.

FRANK A. LEACH.

San Francisco, August 23.

Mining Buildings and Mining Education.

The Editor:

Sir—A few remarks will not be out of place regarding the practical and excellent speech you made at the opening of the Hearst Memorial Building, of the State University, Berkeley, on August 23; also a suggestion for its future welfare. Your comment in an editorial of the issue of August 31, concerning the patriotic speech made by W. R. Hearst is very true, but how much more true and just are your criticisms on the conduct of his daily papers. With his scope of journalism, he could wield an enormous power for good and peace in this country. Is it possible for young men to grow up good citizens, with a sense of duty, to guide their native land onward in a path of morality, not only social but intellectual, and formulate an atmosphere of peace and human kindness between men, when every morning they turn to their daily literature and read nothing but a foment of scandal and filth, capped with ideas that flaunt a red flag before their eyes, as no bomb-thrower ever did?

Your remarks concerning the public, as to its expectations and receipts, are decidedly characteristic. The average public knows absolutely nothing about mining. Mining is totally different from other business. As regards mining for gold, supply and demand, market, bulls and bears cut no figure. Mining cannot be run on 30, 60, 90 days credit system. And on this account, so many of the public who become interested in mining, imagine that it is a failure, swindle, or robbery, simply because dividends do not come pouring in within six months or a year. Many a good young fellow is ruined by such ideas. He is really far more keen and far-seeing than his company, but because his work does not show at once, they imagine him incapable of handling the proposition, never thinking nor investigating, because not knowing how, that he is laying a foundation for future and greater dividends. On the other hand, many young men, who having passed four years at a School of Mines, essay too much, and imagine they are born managers or experts. Their dreams are soon shattered and their house of cards tumbles around them, on account of a poor foundation. Again there is a third sort, I am sorry to say, that become so inflated with their self-supposed high sounding affix of B. S. that nothing is beyond them. Anyone below them in position, or not so lucky, is a decided nuisance, and certainly not eligible to such exalted acquaintanceship. They are ruined because they are 'snobs,' and of course, the practical is out of the question.

The debt of gratitude due Mrs. Hearst is great indeed. She has nobly done her share, and really stands out alone in generosity. How many millionaires have the mines of California made? How much have they given in gratitude for their good fortune? Can this State point to many monuments of their generosity? What have they done with their money? Are they stingy or callous? They are both, and more, decidedly mean and contemptible. Palaces rise in the East, and extravagance, vulgar in the extreme, runs amuck, but never a thought of anything that would help their fellow man or woman to a more enlightened, refined, or successful life, nor thanks to the place that made them rich. The pro-

fessors at the University are most miserably paid. Double their salaries would not be too much, especially when we make the odious comparison of union wages today. Why not let these men that are earning \$8 and \$9 per day pay more taxes, and raise the wages at the University? Has one penny ever been donated for professorships in any way? A few chairs may have been endowed, but that did not help the ever-present needs, as it was generally for something new. The School of Mines needs more professors. The suggestion for the pursuit of practical and technical work is very commendable. It would certainly bring all the latest progress into the lecture-room. But I think I can suggest something even more advantageous to the School of Mines, the University, and the whole State.

Today California has produced \$1,450,000,000 in gold from her mines. How many millions has the University had for itself direct from Mother Earth? Not one. A few months ago, a farm was bought for the agricultural department. Has the School of Mines a mine? Why not? In years gone-by one of these properties could and should have been obtained. They went begging, and afterward under capable men, produced millions. These latter would have endowed the University, and it could have kept itself. The students could have run the mine and gained all their practical experience, and while they may have made good in the past, how much better this system would have made them. Today the University is a drag on the people of the State, and the money is flaunted in our faces by a few parvenus, who disgrace us and themselves by their ill-bred conduct elsewhere. There has been a short-sightedness somewhere, and the more regret is that it exists today.

The School of Mines should have a practical working ground, a mine—two in fact, one gold, and one copper—modern mills, and all processes pertaining to amalgamation, classification, screening, concentration, cyanidation, filter-press, etc., besides a small smelter for base ores. In this way the technical side could be brought in actual contact with the practical, and the lectures would be infinitely more effective. It would also give the students a real taste of what mining really is, and what they must expect. The course could be extended to five years with profit.

Supposing today \$1,000,000 is set aside by the State—and what better time than these prosperous days—this is a maximum figure, and it will purchase two mines and erect adequate plants for milling and smelting. The students can do the work from the start, plan, erect, etc., then develop and work the mine and mill. A small wage can be paid them, and thus have minimum expenses, and enable many to get through college. With good judgment in the beginning, and capable management afterward, handsome interest can be realized from the investment. This would yield a monthly income, permit of raising the salaries of the professors, and more besides. The State in general would be relieved, and I think in time, the University might become self-sustaining. It is perfectly certain that a farm will never sustain the State, nor even the Agricultural Department.

The average student today considers mining much as a pastime, because he is not initiated into its true life generally, until he has graduated or gone too far in his studies to throw up his chosen profession, should he not like it. True, they go to a mine during vacation for a few weeks, but there the foreman always gives them a snap job, and in the evenings the girls in town go crazy over their bell-topped pants. Mining is really a hard life, but it is most fascinating, and when a man has attained an honest eminence in mining, he has attained something that all the other professions cannot equal. And although he can

attach a yard of letters donated by societies to his name, the proudest of them all is the M.E.

C. O'BRIEN.

Oakland, September 10.

MEXICAN MINING CONCESSION.—A concession for the development of the Guanajuato mining field has been granted to a company of Guanajuato. The intention of the company is to sink a 1,000-metre shaft for the purpose of investigating the ores which are supposed to lie deep underground in the State of Guanajuato. As the enterprise is one of great public importance, and as the Mexican Government has for some time contemplated a geological exploration of this nature, the company has been granted a direct subsidy and certain rights with relation to the other mining companies operating in the same district. The contract is to run for 10 years from February 4, 1907, and during its lifetime the company shall be exempted from the payment of all Federal taxes, with the exception of the stamp and mine taxes and assessments on capital, bonds, shares, buildings, roads, and works of the company. The import duties on the machinery for this enterprise and for the plants where the ores are to be treated shall be returned to the company. This exemption shall only apply to the machinery imported before June 30, 1908. Students of the National School of Engineers will be permitted to practise in the mines being worked and also in the reduction plants which the company may construct. The company and those who may succeed it in its rights, as well as the employees and other persons interested in the company, shall be considered as Mexicans in all matters having relation to this contract, and shall be subjected exclusively to the jurisdiction of the courts of the Republic.

USES OF COBALT.—The characteristics of the metal cobalt and its compounds are much like those of nickel and its compounds. The methods used for extracting one metal from its ores are similar to those used in the case of the other. Since these methods are complicated, an attempt will not be made to describe them. The reader, desirous of a knowledge of the methods, is referred to some standard work on metallurgy, such as that of Schnabel. In former times cobalt glass, 'blue color,' was made directly from some of the purer ores carrying cobalt, nickel, silver, and arsenic. Most of the arsenic was first roasted off, and to the residue were added the constituents of potash glass—powdered quartz and carbonate or other compound of potash. The roasted ore, with these constituents added, was then melted down, the cobalt uniting with the glass to form smalt and the nickel and silver settling to the bottom of the furnace. If a little arsenic was not left in the ore some of the nickel would also combine with the glass, thus injuring its color. The blue glass, or 'smalt,' was powdered and sieved, and was then ready for the market. Cobalt now comes on the market in the oxide form, the latest quotation being \$1.60 per pound for the pure oxide, CoO. There are seven or eight manufacturers of this oxide in Europe—three in England and two or three each in France and Germany. Little cobalt is used in the metallic form, owing to the fact that nickel serves practically the same purposes as metallic cobalt and is much lower in price. It is said that a little cobalt added to nickel in plating tends to produce a more silvery and less steel-like lustre. By far the largest consumers of cobalt are the potteries.

A NUMBER of mills on the Rand show a duty of over 7 tons per stamp; in July the mill of the Luipaard's Vlei Estate crushed 8.5 tons per stamp per day. This increase is due to the use of tube-mills.

top-weight increases, bulkheads become necessary in order partly to hold up the back, but mainly to keep the sets from 'jack-knifing' or 'riding' under the top weight.

By contemporaneous filling of the stope we cheaply and efficiently resist the side weight in them, but at present we take care of the top weight in a far cruder manner. The solution of the problem of the side weight has forced the adoption of flat-roofed stopes in which the top weight becomes a maximum. Is there not a way to bring this top weight to a minimum while we resist the side weight by means of filling? Must a waste-filled square-set stope have a flat roof? I think not.

The miner, running even so small a working as a drift, arches the roof because he knows that it saves many a bump on the head and much cleaning of track, which would result from the falling of small slabs of ground in case the roof were flat. The experienced miner barring or picking down a back (unconsciously perhaps, for this knowledge of the arching of roofs has become almost instinctive in him) forms his judgments as to where to test the back from the nearness of its shape to that of the arch that he would expect in such a rock. He uses blocking over each post of the square-set partly to keep the caps and girts from being blasted out but also to sustain the back. He knows that the ore is usually strong enough to arch itself over a space of five or six feet and that thus he can concentrate the weight of the roof over the posts and to a great extent save the caps and girts; and this feature of top blocking is especially impressed upon miners that have worked in the soft oxidized ores of Bisbee and of Leadville. When the top blocking is left out in such ground the roof settles down bodily upon the timbers and in time the lagging is broken by the weight. Besides, when mining progresses to the floor above, these timbers are apt to be broken in case blasting is necessary. But when blocking is used, the roof, after a little sloughing, arches itself. Owing to this deadening of the floor and to the fact that the ground has not settled down either on the timbers or the lagging, there is no anxiety at blasting time.

Everywhere in mining we see use made of the dome of equilibrium, but at present in square-set mining little advantage is taken of it. I believe that in taking full advantage of the self-supporting property of the arch lies the correct method of withstanding the top weight. It is not by using large timbers, doubling-up pieces, and bulkheads. Instead of making the roof flat, the roof ought to approach (as nearly as other conditions will permit) the shape of the dome of equilibrium for that kind of ore. Then the rock supports itself. In this proposed modification of square-set mining, the first step would be to run a two-compartment raise to the level above, the raise being in the centre of the block to be mined, with its long axis across the strike of the deposit. This raise gives good ventilation to the future stope and is necessary for filling it with waste. After the raise has been holed, square-set stoping would begin at the bottom. The stope would be carried from the foot to hanging wall and, as it enlarged in width along the vein, it would also be increased in height so that the roof would approach the shape of an arch previously determined.

The shape of this arch would be determined by three considerations: In order to mine cheaply it is necessary to keep down the cost of timbering, of mucking, and of filling the stope. In order to make the cost of timbering as small as possible, full advantage must be taken of the self-supporting power of the ore itself. To do this the roof must approach the shape of the dome of equilibrium. To bring mucking to a minimum, the rock must be

handled by gravity as much as possible; wheel-barrows must be eliminated. The cheapest way to solve the mucking problem in square-set stopes is to blast the ore onto slides that carry it to the chutes. Therefore, the shape of the roof must be such that the slides can be given sufficient pitch to carry the ore easily. In order to make the filling cost a minimum, full advantage must be taken of gravity in filling the stope with waste. As the angle of repose of broken rock is about 50° , in most cases cars and slides must be used to aid in filling the stope.

As, in this proposed method, we are going to use slides for transporting the ore to the chutes, we can by slight changes use these also for sliding the waste into those sets that otherwise would be hard to fill. Consequently, in this method the angle best adapted for getting the ore out is also suitable for getting the waste in. The roof of the stope ought to approximate as nearly the dome of equilibrium as the angle necessary to allow sliding of the ore will permit. The only data known to me, in regard to the shape of the dome of equilibrium, is the following taken from *Mines and Minerals*.^{*} In shales, slates, and rocks breaking into a foliated condition the angle from spring of arch to crown is 30° , consequently the height of the arch is one-fourth the span. In sandstones, limestone, conglomerates, and rocks breaking into large irregular pieces the angle from spring of arch to crown is 60° , consequently the height is seven-eighths the space. Rock will slide on a board chute at an angle of 30° . In many ores sliding occurs at a somewhat lower angle. Therefore the above data would indicate that in most rocks the shape of the roof can approach quite nearly the dome of equilibrium, and still the ore-slides can be given sufficient grade for their proper working, consequently the roof of the stopes under the proposed method would be made to assume the shape of the dome of equilibrium. Two sets below the back a series of slides made, say of 5 by 10-in. timbers, and resting upon the caps, would be inserted. The ore would be blasted down on this main slide, which would carry it to the chutes placed at intervals in the line of sets marking the boundaries of the block to be mined. To prevent boulders getting into the chutes, grizzlies would be placed on the top sets under the spots where blasting was to be done. As these grizzlies would be composed of 5 by 10-in. or 8 by 8-in. timbers, with blocks of wood for spacers, all merely resting on the caps and held in position only by wedges, they could easily be moved to another set as mining progressed.

The space between the slides—for the stope would be symmetrical with respect to the central raise—would be filled with waste sent down through the raise. In many stopes, owing to their shape, complete filling by gravity would be possible, but in most stopes portions would have to be filled by means of a car and slides. As indicated above, by slightly changing the ore-slides, they could be used to slide the filling wherever desired. As the stope progressed, the slides and grizzlies would be raised a set at a time and the new open space between the slides would be filled. Thus the stope would be kept completely filled except for the two sets next the roof of the stope. The foregoing description presupposes that the vein material and the country-rock are strong enough to stand until the stope can be enlarged to reach the boundaries of the block. In case that is impossible, temporary or 'joker' chutes would have to be carried up through the filling and used for getting out the ore until

^{*}Vol. XXII, p. 36. In this article entitled 'Principles Relating to Post Timbering,' the arching is attributed to the fact that the roof slabs off into irregular boulders which interlock and key one another, forming the arch. I think, on the other hand, that the arch is due more to the inherent strength of the rock than to the binding of the slabs that scale off from the roof.

the boundaries were reached; then the permanent chutes would be used and the 'joker' chutes abandoned.

In the method thus described the top weight, owing to the shape of the roof, would be supported mainly by itself. The side weight in the upper portion of the stope would be carried by the timbers, in the lower portion the waste-filling would support the walls. In the top portion of the stope the timbers would be greatly strengthened by the pyramid of waste, which would completely fill all the sets except the two adjacent to the roof. This filling would steady these sets and all danger of their swinging would be avoided. This would permit the mining of much larger blocks of ore than would be possible in the same ground in case that a flat-roofed stope were used. Owing to the fact that the timbers in the two sets below the roof would be subjected to considerable wear and tear from the rocks passing down the slides, round timbers would be better than square ones in the square sets. These round timbers are best framed similar to the Brunton system, in vogue in many of the Butte mines of the Amalgamated Copper Co. As the timbers are only subject to wear for a comparatively short time, this wear and tear ought not to damage them seriously. The bottom of the central raise would be closed with a trap-door. This would prevent the short-circuiting of any air and consequently all the air would have to pass up through the stope past the working faces and up through the upper portion of the central raise to the level above. The shape of the stope ought to aid greatly in producing good ventilation.

In the method as outlined the arch has been made to run across the vein, and it has its foundations on the ore. This gives a stronger foundation than if the axis of the arch ran with the vein, for the cohesion of the ore within itself is greater generally than the adhesion of the ore to the walls of the vein. The above would be the method used in mining the first blocks or 'rooms,' but in mining the pillars the axis of the arch would run along the vein, for, as the ore to each side has been previously mined, we would have to depend upon the adhesion of the ore to the walls as the main support of the arch in the pillar. In the pillar the greatest pressure would probably be from the waste-filling to either side, and not from the wall-rock, for the walls are held apart by the back of ore above and the waste-filling below. Owing to the fact that the ore would be slid into the chutes, a stope could be mined much more rapidly than in an ordinary flat-roofed square-set stope. Moreover, owing to the shape of the stope it can be filled with waste quickly, and so what might in the case of a flat-roofed stope be a bad cave, could in this arch-roofed stope be prevented. Both of these possibilities, that of quick mining and of quick filling, are advantages not to be despised. By this method full advantage is taken of the self-supporting power of the ore, thus decreasing the cost of timber; full advantage can be taken of gravity in extracting the ore and introducing the waste-filling, thus bringing the cost of mucking and filling to a minimum; owing to the shape of the roof, ventilation ought to be much better than in a flat-roofed square-set stope. In exceptionally heavy ground, it would be possible to dome the roof of the stope instead of arching it only one way. Possibly experience may prove that it is better to have the axis of arch across the vein instead of along it in the pillar stope and the axis along the vein in the rooms. While the slide is given much prominence in this method, its wholesale use is not essential, for, by advancing chutes through the filling and using short auxiliary slides, the arched shape of the roof can be retained and the wholesale use of slides abandoned.

I close this article with the request that mining men

will criticize the proposed method. As it is only a paper method of mining, it doubtless has many flaws in it at present, but I hope there is sufficient merit in it to point toward the right direction in regard to bettering square-set practice. Possibly it errs in too liberal use of the slide, but I hope not. At present, about the only advantage taken of gravity in waste-filled square-set stopes is that the ore falls upon a good floor. Ought not better advantage be taken of gravity?

VANADIUM AND URANIUM are nearly always named together, as almost all ores containing one metal also contain the other. Uranium, however, is used but little for steel-hardening purposes outside of the well known German steel foundry and gun factory of Krupp at Essen, where the use of uranium has apparently passed out of the experimental stage, but where the knowledge of its application is guarded most jealously. Vanadium, on the other hand, has been used in France and Sweden for many years for increasing the tensile strength and toughness of steel, but its high price has prohibited its application on a large scale. The French and German armor-plate works use an alloy of vanadium and nickel and obtain excellent results and the superiority of French automobiles is said to be due to the liberal application of vanadium steel in their construction. Uranium has been detected in more than a dozen different minerals, which are found in nearly all mountainous countries of the globe, but the percentage of the uranium is generally too small to warrant extraction, and workable deposits of uranium minerals are limited. Since the discovery of radium these uranium minerals have become of special interest, as the percentage of uranium is in direct proportion to the radio-activity of the mineral, and all other applications of uranium metal and uranium salts, which latter are used to some extent as color on porcelain and glass, are overshadowed by the importance of uranium as the chief source of radium.

FRENCH RESPIRATORY APPARATUS.—The minister of public works has recently issued a decree ordering the employment of respiratory apparatus in the mines of France. Every mine employing 100 men underground at the same time must be provided with portable respiratory apparatus, ready for immediate use and allowing a miner to remain at least one hour in an irrespirable atmosphere. The number of these apparatus must be not less than two for each pit, placed in charge of an engineer or inspector familiar with their working, and provided with 10 picked men, who will be trained in the use of these apparatus and sent to the seat of danger immediately whenever the necessity arises. A year is allowed each mining company to comply with the stipulations of this decree. These precautions have been suggested by the great disaster of Courriers last year.

IN MEXICO, near Pachuca, in the State of Hidalgo, are great prehistoric obsidian mines. At this point, though the material exists in such quantity, yet the outcrops are all buried under the heaps of debris and fragments left by the ancient workers. Near Tequisquiapan, in the State of Queretaro, there is another locality some 60 or 70 miles west of the former, where a similar obsidian occurs abundantly, but does not appear to have ever been mined or developed, and where the outcrops are entirely accessible. The place is near the border of the States of Queretaro and Hidalgo, on a range of low hills east of the San Juan river, between the crossing of that stream by the Mexican Central railroad, at San Juan del Rio, and by the National Railroad of Mexico a few miles below.

Dumping Residue at Kalgoorlie.

Written for the MINING AND SCIENTIFIC PRESS
By M. W. VON BERNEWITZ.

It is doubtful whether any mining centre in the world has been so troubled with the disposal of its mill residue as Kalgoorlie. The area of 12 of the producing mines, on what is known as the Golden Mile, is about 430 acres.

old, as well as the present residue, contains gold enough for profitable re-treatment, so it is best to have it near the treatment plants. On a windy day—and we get plenty of it here—the dust (ranging from 20 to 200 mesh) flying about the mines is terrible, and a great deal of damage is done to machinery through it. There are several methods for disposing of the residue, namely, trucks drawn by horses, Robins belt-conveyors, a combination



Fig. 1. General View of the Kalgoorlie Mines.

There are many single mines in the world that cover this area alone; here it is divided among a dozen, and it is covered with the head-gear and hoists of a score of large shafts, together with the machinery necessary for the reduction of about 4,300 tons per diem. In the earlier days of the field, little attention was given to the disposal of residue, and it was dumped all over the

of these two systems, the Bleichert system, and trucks drawn by electric locomotives.

At the Associated mine about 320 tons are discharged daily from seven presses onto a horizontal Balata belt, which discharges into trucks at the dump, and these are taken out by horses. An inclined belt is to be erected shortly. Having practically covered the best part of its



Fig. 2. Associated Northern and Oroya-Brownhill Dumps.

leases, but when the big mills commenced working at their maximum capacity, this matter became a difficulty, which, on several of the mines at the present time, is causing great expense. Compared with the ore that is extracted from underground, very little residue is sent below for filling depleted stopes. Certainly it could be railed right away from the mines, but in most cases the

property, the Associated Northern Blocks recently erected a conveyor to elevate its slime, discharged from three presses at the rate of 120 tons per diem. There is a horizontal Balata belt feeding an inclined belt, at an angle of 27°. The photograph (Fig. 2) shows how the latter belt is erected on top of the old dump, and a scraper fixed across enables the slime to be thrown off at any desired point, so as to fill around the structure. All the belt-conveyors are of the Robins type.

*The photographs illustrating this article were taken for the author by Mr. F. Goyder, on the staff of the Associated Northern Blocks.

The largest system of rubber belt-conveyors is at the Golden Horseshoe, which puts through its 18 presses about 600 tons of slime daily. There are about 80 tons of sand discharged daily from the leaching vats, which is sent below. The Horseshoe presses are in three rows, under which are a like number of belts, that discharge onto a very long belt running up to the dump. This belt in turn feeds another at right angles to it, running the length of the dump, this one finally discharging onto

haulage, as shown in Fig 3. Now and again a large heap of slime will slide from the top of this dump to the bottom, making a channel on its way. The elevator is motor-driven. Since writing the above, the Ridgeway slime-plant has been working, and the residue from the 10 machines is mixed with water and pumped about one mile distant, where it settles.

The Ivanhoe crushes about 620 tons of ore daily with its 100 stamp-mill. (See Fig. 4.) There is the treatment



Fig. 3. Great Boulder Proprietary Dump. Lidgerwood System on Left; Bleichert on Right.

a horizontal stacking-belt. All belts are motor-driven.

The Great Boulder Perseverance takes about 500 tons daily right off its lease to an area one mile distant. The system is as follows: Under each of the 11 presses is a belt, which feeds a main collecting-belt, in turn feeding another at right angles that discharges the slime into slide-tipping trucks, holding two to three tons each.

of sand, slime, and concentrate. About 50% of the sand, say 150 tons, is sent below into the mine, the balance being trucked to the circular dump, along with the treated slime and concentrate from eight presses, by an electric locomotive.

Three hundred and thirty tons daily is trucked from the six presses at the Kalgurli. This company has very



Fig. 4. The Ivanhoe Dump.

These are taken away by an electric locomotive. The belts are made of rubber and are motor-driven.

Some elaborate systems have been, and are being, worked by the Great Boulder Proprietary company. For some years a Lidgerwood hoist with flying fox was used, making a heap some 60 ft. high. All the spare room being filled up, an elevator on the Bleichert system was erected near the cyanide-plant. Some 440 tons of fairly wet slime is dumped per diem from the 13 presses into trucks, and then elevated by the endless wire-rope

little dumping room left, but adjacent vacant property will probably be used. About the worst sufferer for lack of space is the South Kalgurli, which has only 11 acres. Discharged daily from the seven presses, 280 tons of slime are elevated by an inclined belt at 24°; this feeds a swinging-boom belt inclined at 27°. All the belts are motor-driven. The Lake View Consols trucks about 350 tons per diem from its nine presses to a large circular dump. This company will soon have to elevate.

Probably the finest example of belt conveyors and a

swinging-boom stacker used in piling residue is working at the Oroyo-Brownhill. About 350 tons daily are discharged from the six presses onto two belts, which feed a cross-conveyor, this in turn delivering to an inclined belt. The latter finally feeds the boom-belt, which can be moved around 180°. All belts are of rubber and motor-driven.

The following are some published costs of dumping :

COST PER TON IN CENTS.				
Mine.	Belchert.	Conveyors.	Electric Loco-motive.	Trucking with Horses.
Associated	12
Associated Northern.....	...	8	...	...
Golden Horseshoe	8	...	...
Gt. Boulder Perseverance...	10	...
Gt. Boulder Proprietary.....	10	...	...	...
Ivanhoe.....	10	...
Kalgurll	10
South Kalgurll.....	...	9	...	...
Lake View Consols.....	12
Oroya-Brownhill.....	...	10	...	...

The accompanying photograph of Kalgoorlie illustrates the peculiar flatness of the country, rendering necessary devices for conveying.

The National Forests.

A point in the industrial progress of the United States has now been reached where development of the country is made, not in the face of the forest, but with its essential aid. The old process of exhausting the supply of timber in a region and then seeking new fields is practically over. Already the lumber industry is turning back on its tracks. A quality of timber is eagerly sought in the Lake States which a few years ago was ignored as utterly worthless, and in the South the whole pine region is being gone over in a close search for the old field pine, a tree once despised but now bought up at prices much higher than those formerly paid for the magnificent timber of the virgin forests.

Abuses have grown up under the laws that provide for the disposition of public land, notably the segregation of large holdings of timberland for speculative purposes. Timber from the National Forests is now purchased by the thousand board feet and payment is made upon the actual scale of the logs when cut. Two dollars and a half per thousand feet is comparatively low as present charges go, but since the cut ranges from 5,000 to 20,000 ft. per acre, the Government receives from five to twenty times as much for the timber as it did under the Timber and Stone Act. Public opinion now demands, not that the Government should dispose of its remaining timberlands as rapidly as possible and leave it to private enterprise to exploit the forest hastily, but that what remains of the National Forests should be more conservatively used. The Government has been forced into the lumber business solely in order that a supply of forest products may be guaranteed to future generations.

Probably 65% of the total stand of merchantable timber within the Forests is on the Pacific Coast, where for a long time the enormous supply of privately owned timber will satisfy most of the demand. This more accessible private timber surrounded the Forests as the meat of an apple surrounds the core. It has been entirely eaten away in many places, while in others it is locked up by speculators. The thing to remember, then, is that this immense body of public timber is there as a great reserve against the time when private timberlands will be depleted, and for use as a weapon against monopoly.

The first effect of National Forests upon prices, particularly where there is still a great deal of available timber, is to raise the price of outside stumpage toward its actual value by withdrawing the excess supply of low-

priced timber from the market. But later, as the supply of timber dwindles and values are forced upward by speculative holdings, the effect of the Forests will be to check the advance of prices. In the virgin forest, growth is just about balanced by decay. In the Western forests, however, natural deterioration is greatly augmented by forest fires. The fires usually do most harm by damaging merchantable timber, but, great as this injury is, vastly more actual loss in forest wealth results from the yearly burning over of the grass and undergrowth of the forest. Ground fires do not consume the large trees, but they destroy seedlings outright and injure growing trees so that they quickly decay. Finally, the forest floor, composed of a mold of needles, twigs, and mosses, is burned away.

Far beyond the influence of the National Forests upon the lumber supply will be their importance in the future. The United States is now facing a shortage in the stock of available timber. The yield from the National Forests will aid greatly to bridge over the period in which mature timber will be lacking, a period which will last from the time the old trees are gone until the young trees are large enough to take their places. The definite result, therefore, of the sale of timber from the Forests will be to sustain the lumber business, to maintain a steady range of timber values and so discourage speculation, and, far more important still, steadily to further the uninterrupted development of the great industries dependent upon wood.

CONCRETE has solved many a vexing problem when it has been necessary to find substitutes for costly structural materials subject to rust or decay, and lately there has been added to the list the concrete mine support as the successor of timber. Now that the 'trick is done,' the only matter of surprise is that concrete was not utilized for this purpose long ago. The successful application of concrete in the Philadelphia & Reading collieries, near Shamokin, is a striking example. Apparently it was not a difficult engineering feat to accomplish. The concrete arches were not introduced to a minimum weight, but tried at a point which formerly needed heavy timbers that were frequently broken. Concrete arches not only answered the purpose, but were constructed at a cost ranging from \$22 to \$27 per arch. So successful has been the outcome that concrete is gradually supplanting timbers in the collieries referred to, and ultimately wood will be dispensed with entirely. The success of the experiment is highly important to the mining industry, as the timber bill has been an item of no small moment. But aside from the economic considerations, there is another point of interest. It is the fact that in this case, as in nearly every other instance where skilled engineers supervise the work, concrete has proved worthy of the confidence reposed in it. —Cement Age.

THE Mexican Central railway is taking 4,000 bbl. of fuel oil daily from the Mexican Petroleum Co. The cost is \$1.10 per barrel, or a total of \$4,400 daily. The Mexican Central is steadily increasing the number of oil-burning engines in service, and within the next few months the road will be taking much more fuel oil than at present. All new engines purchased by the Mexicau Central are equipped for burning oil, and engines are being constantly remodeled in the general shops at Aguascalientes. Oil-burning engines will be soon placed in service on the Chihuahua and Guadalajara divisions of the Central. Storage tanks are being prepared at Guadalajara, Yurecuaro, Zapotlan, and La Vega, and metal delivery tanks are now being erected. Some oil has been unloaded at Guadalajara and Zacatecas.

The Institute and Advertising.

The correspondence published in the next column is self-explanatory. It relates to a matter that has provoked a good deal of discussion among members of the Institute and yet it is a subject difficult for a technical journal to discuss because it deals with a field of activity in which there might be supposed to be some competition. However, this feature is negligible, especially if the reader will give credit for motives other than those arising from self-interest. The exchange of letters between a group of representative Western mining engineers and the Secretary of the Institute puts the question of advertising squarely before the members. Mr. Courtenay De Kalb and his friends recorded their objection in a practical way, by offering to subscribe toward the funds evidently needed, and Dr. R. W. Raymond replied in his usual effective manner. Obviously the Institute has incurred financial obligations that it is impossible to meet out of the annual dues from members and, in order to overcome this difficulty, it was decided to sell advertising space in the Bulletin. Advertising pages certainly do record "the state of the art" and they have a historical value, but we doubt whether many keep them for such a purpose; on the contrary, to most people the advertising page has a distinctly ephemeral value, for it indicates the best machinery available at the moment. When such pages are old, they become out-of-date. Not many members of the Institute are engaged in writing the history of the art; most of them are doing the work of the day with the latest appliances. Moreover, the Bulletin of the Institute is so bound as to enable the members readily to detach the advertising pages and to separate any article of particular value. The advertising is less an integral part of the Bulletin than of an ordinary technical journal. However, here we tread on dangerous ground.

The real problem is how to obtain the money needed for the Institute. If advertising is objectionable, how else can it be done? To increase the dues would work a hardship on many members, particularly the younger men, to whom the Transactions are of especial value. The initiation fee might be raised, but this would be ineffective, as it would apply only to new members. It has been suggested to form an inner circle of 'Fellows' or some other sub-division of select men, that is, those specially qualified by training and experience, after the model of the full members of the American Society of Civil Engineers. But we do not advocate this. Quite the contrary. The Institute has a character—or lack of character—that is not likely to be altered at this date; it is frankly democratic, and has long since failed to give any diploma of engineering ability or professional reputation. Not to be a member argues a mining engineer to be a crank, to be a member indicates nothing in particular, save the desire to obtain regularly a large body of technical information excellently printed and edited with a rare skill. What is to be done? The problem has manifestly not been solved by the little advertising obtained for the Bulletin. The difficulty facing the management of the Institute still exists. We shall be glad to offer our pages to members desirous of discussing the matter.

On January 1, 1907, the Institute had 4,048 members and associates. Many of these live in foreign countries, so that the cost of sending circulars, bulletins, and volumes is increased by the higher rates of postage. About 400 members live in New York and the adjacent portions of New Jersey and Connecticut; it is to them that the new building of the engineering societies is of particular interest and use. The letters follow:

DR. ROSSITER W. RAYMOND,

Sec'y American Institute of Mining Engineers, New York.

DEAR SIR: We, the undersigned members of the American Institute of Mining Engineers, being apprised of the inadequacy of the funds derived from membership fees for the support of the activities of the Institute, and regretting a resort to the use of the Bulletin as an advertising medium, respectfully offer ten dollars (\$10) each, in addition to their regular dues, toward a fund to be applied in such manner as the Council may approve.

We hope that this contribution on our part may constitute the beginning of a general voluntary offering by the members, being convinced that practically all would be willing to respond in such an effort to relieve the Institute from financial stress.

(Signed)

SEELEY W. MUDD,

JOS. P. GAZZAM,

WM. S. NOYES,

COURTENAY DE KALB,

MARTIN J. HELLER,

H. W. TURNER.

August 20, 1907.

PROF. COURTENAY DE KALB,

121 E. Ave. 49, Los Angeles, California.

MY DEAR SIR:—

Your favor of August 20, with enclosed letter from yourself and Messrs. Seeley W. Mudd, Joseph P. Gazzam, H. W. Turner, William S. Noyes, and Martin J. Heller, and checks from the signers to the aggregate amount of \$60 (namely, checks for \$10 each signed by Messrs. Turner, Noyes, and Heller, and your check for \$30) is at hand.

The present financial situation of the Institute involves two separate burdens, namely, (1) the extra current expense of our housekeeping in the new building; and (2) the annual installment of principal and interest on the ground occupied by the building. (Mr. Carnegie gave the building, but not the ground.) The second we must pay by subscriptions; our one-third amounted to about \$180,000. We have paid off about \$60,000, I believe. The first item—that of increased annual expense—represents, of course, increased space and facilities, and especially a practically new department—that of a library well fitted up and administered. We are very anxious to meet the extra annual expense without increasing the annual dues; and I hope this will be done by means of the advertisements in the Bulletin.

You will see that this part of the case is not to be met by subscriptions. I do not think it could be met even by doubling the membership at the present rate of dues, if that were possible. The fact is, that we are giving for \$10 a year a little more than we can afford; and we are determined neither to lower the amount and value of our publications nor to increase the annual dues. At all events, we shall try the experiment.

I do not understand the objections which a few members have expressed to the addition of an advertising supplement to the Bulletin. My own experience of 50 years leads me to value advertisements *for preservation*, often more highly than the text. After a couple of years, I look through old advertisements in periodicals for evidence as to "the state of the art," the names of manufacturers, etc. Whoever has not learned their importance has something yet to learn.

We will turn over these checks to the Land fund, unless you object. I have directed the bookkeeper to hold them in the safe for a few days, to give opportunity for a reply from you.

Yours truly,

R. W. RAYMOND,
Secretary.

Old Methods in Mexico.

From a report made by E. Tilmann, Royal Prussian Commissioner of Mines, in 1865, we get an interesting glimpse of conditions at Guanajuato as they appeared to an experienced mining engineer forty years ago. Herr Tilmann was on furlough from the Royal Mine office of Dortmund and made an elaborate report on the mining properties owned by the Sra. Doña Francisca de P. Pérez Galvez, the lone survivor of a family famous in the historic development of Guanajuato. This report was published at Münster in 1866. It is a long document and contains many valuable notes. In regard to the methods of mining, Herr Tilmann says:

"Each mine has its *bocamina* (or *boca de mina*), that is, an opening or inclined shaft for exit, which is furnished with steps; at a depth of 30 or 40 m. is a large room converted into a chapel. From here on the stairs follow the dip of the vein (45°), but sometimes they have a slope of 50 to 70%. It is a very uncomfortable ascent to climb on these stairs from a depth of 500 metres.

"The ore extraction is done by men, the *tenaleros*, mostly Indians, who carry the ores in sacks (woven from aloes) upon their backs; from the two upper ends of the sack hangs a wide band which the man, who carries the ore, puts around his forehead and so prevents the sack from slipping, thus leaving his hands free. The ore-carriers bow under the weight and in steep places only do they support the load with their hands. One cannot help admiring the strength of these men, usually loaded with 225 to 350 lb. I have often seen a man carrying 18 to 22 *arrobas*, that is, 450 to 580 lb. through very uncomfortable, scarcely passable drifts in a mine temperature of 12 to 25° . Main working passages to any degree regular and comfortable are not in existence. The ore-carrier picks his way through one of the passages which he considers the best. These men work entirely upon contract and obtain 22 centavos per *carga* (3.5 cwt.) for a 100 m. distance, earning 75 cv. in 12 hours. The ore is thus brought to the *despacho* (ore-bins) and is then hoisted to the surface in untanned cow-hides (*mantas*) by *malacates* turned by four horses. Such a load weighs 10 to 12 cwt. Hoisting from the shaft costs 5 cv. per *carga* per 100 metres."

The temperature underground is stated in degrees Réaumur; 12 to 25° R. would correspond to 60 to 88° F. The Indians are the *peones* or Mexicans of unmixed native blood. By 'aloes' he means the *maguey*, the fibre of which is used for many purposes. Next he describes the system of wages and marketing of ores. Similar methods persist to this date in some of the mining districts not invaded by foreign ways. The *buscon* or tributer is still an important man in Mexican mining. Appraisal of ore by eye, without weighing or assay, survives at Pachuca to this day, the appraiser being known as the *rescatadero*. The method of testing ore by washing in the *jiacara* resembles the panning shovel of the Cornishman, the *batea* of Brazil, the pan of the Californian, and the horn spoon of the prospectors in Arizona. The horn spoon is the direct descendant of the *jiacara*.

Herr Tilmann says:

"Mine administration entirely corresponded with the business. The common 'wage system' was as follows: Permission to individual laborers was given to work in the mines; the same could employ on their own account other laborers, drive drifts, and open stopes, in fact carry on all the prospecting they pleased, so that they might find ore. (Hence the name of *buscones*, or searchers.) They were usually given powder and tools free, but had to pay for lights and for hoisting ore to the surface. A *buscon*, finding ore, had the right (not by mining law, but by custom,) to mine the same for his own account.

The ore produced, if rich or poor, was always divided into two parts; the *buscon* received one-half as wages for his work, and he had the choice to sell the ore himself or through the mine agency. The other half was amalgamated by the mine-operator in an *hacienda* under a tax determined by the law, known as the *maquila*. The *hacenderos* (proprietors of the amalgamation works) deducted the amount of the treatment charge for amalgamation out of the silver yielded and gave the remainder to the mine-operator. Only this latter amount of silver was registered in the books as the production of the mine. Besides the work of the *buscones*, some mining was done on contract and wages by day's work, but this was seldom. I have previously mentioned that the lack of desire to consolidate the mines was disadvantageous to mining in Guanajuato. On account of the *buscon* system it was not possible to handle the ore economically in any of the mines; each mine was opened by the *buscones* into small workings, entirely independent of the other. This explains the confusion in the old workings of the mines. When the production became so large that the mine could not amalgamate all its own ores, the same were sold, with those of the *buscones*, at public ore-sales (*rescates*) to the highest bidder. In these sales the weight of the ore-heaps was calculated by measurement with the eye and the value of the silver contained was determined by *tentadura* (or test). To obtain the *tentadura* they used the *jiacara*, a thin, light vessel, about 6 in. wide, varnished black on the inside and shaped like a hemisphere. The ore was first pounded and finely triturated between stones, washed, and the remaining small quantities of ore conveyed with clear water to the *jiacara*. The *jiacara* is held in the right hand and the ore loosened by slightly vibrating in the left hand, thus the silver ores arrange themselves (with the pure gold) in a bluish strip around the edge of the *jiacara*. The value of the silver and gold contained in an ore-pile is calculated by the color and size of this strip. As the result of much experience the miners can determine the value almost exactly with certain grades of ore. But there are many ores in the Veta Madre that are very rich, although they do not show any visible silver, that is, those peculiar double combinations of silver sulphide with iron sulphide do not show any silver in the *tentadura* although rich. Such ore was often not mined or thrown aside as waste.

"The money earned from the sales of ore, together with the silver returned from the *haciendas*, made up the whole production of the mines. The accounts of the mines were settled every Saturday, as at the present time; all salaries, wages, etc., were paid weekly. The weekly *memorias* was a list of all payments made by the mines; they included general expenses, wages, costs of handling the water, etc. (that is, the ores belonging to the *buscones* were not taken into account at all). The weekly profit or loss of the mine was found by subtracting the *memorias* from the stated silver production."

Next he describes the methods employed in taking water out of the mines. He tells of the hides sewn together so as to serve as buckets, and of the horse-whims or *malacates*, by the aid of which the Mexican was able to sink such deep shafts as the great pits of the Valenciana. He says:

"The system of controlling the water in the mines of Guanajuato, and in other parts of Mexico, will appear barbarous to a European, but it corresponds with the present standard of civilization in Mexico. The water is brought to the surface from depths of 600 m., in sacks (*botas*) of untanned skins, by means of *malacates*. Two cow-skins are laid together, hair outside, sewed tightly on the edges, so as to form an elliptical bag, which carries 18 to 32 cu. ft. of water. On the open end the

hides are stretched around an iron hoop, which gives an opening for bailing and discharging the water. The iron ring is fastened to the hoisting rope by leather straps. The shafts are not divided into compartments. To prevent excessive vibration the *botas* are made to glide on the sides of the shaft. A *bota* costs 11 pesos and lasts 3½ weeks. For hoisting ore to the surface and bailing water, only untanned calf-ropes of 1½ to 2½ in. diam. are used. These last for three months and cost 2½ reales or 30 centavos per running metre. The ropes run over rollers of mesquite-wood or of iron 60 cm. diam.; the rope drum is 5 m. diam. Three or four arms (each 8 to 9 m. long) are fixed on the vertical axis of the drum; three horses are harnessed to each of these arms. A speed of one metre of the rope corresponds to a speed of four metres of the horses. In hoisting the water from the Cata the speed of the rope was 80 cm. per second (December of last year), the speed of the horses being 3.6 m.; the horses ran in a continuous short gallop and were changed every four hours. A horse costs 20 pesos and lasts two years. Its maize and straw cost on an average daily 21 centavos."

In another part of the report he offers some general remarks concerning the development of mining in Mexico, and especially at Guanajuato. These are his words, translated from the German:

"Before New Spain was discovered, the natives knew the use of the several metals, such as gold, silver, copper, lead, and zinc (whether iron is doubtful). They understood how to win them not only from float and placers, but by vein mining. In the days of Montezuma the silver mines of Tasco, in the State of Coahuila, were worked; likewise the copper mines of Inguarán in the State of Michoacan. The Indians of New Granada and Peru were foremost in smelting ore; in the large cities of Anahuac, especially Azcapotzalco and Cholula, the art of manufacturing gold and silver vessels, etc., was highly developed. According to reports received by Humboldt, from Indians at Lican, silver ores were treated by melting them with a blast. Holes were dug and silver ore mixed with coal was thrown into them. Many Indians lay down around these holes, and blew in the necessary air through long bamboo pipes. The Spaniards brought their knowledge of mining to Mexico from the little attainable, in the 16th century, in Germany and other parts of Europe. A large industry developed. The statistic reports go back to 1690; from this time to the declaration of independence of Mexico, in 1822, the following amounts were minted:

Names of Mints.	Pesos.
1. Mexico, 1690-1822.....	1,640,493,784
2. Zacatecas, Dec. 11, 1810-1822.....	19,388,099
3. Guanajuato, 1812-1813 (end).....	992,803
4. Guadalajara, 1812-1822.....	2,990,033
5. Durango, 1811-1822.....	5,000,000
6. Sombrerete, Oct. 16, 1810-1812, when it stopped work...	1,561,249
7. Chihuahua, 1811-1814, when work was suspended.....	3,603,660
Total from 1690 to 1822.....	1,674,033,491

"In connection with this it is probable that a certain part of the silver and gold production was exported in bars and was not minted in Mexico; but there are no reports of this.

"After the death of the Emperor Charles V., Spain exclusively influenced Mexico and tried to prevent all communication between New Spain and the rest of Europe. The improvements made in Germany, England, etc., in mining and amalgamation work, were not brought to Mexico. From the time of Charles V. to 1822 the Mexican miners did not learn anything from the European miners. Mining in Mexico at the close of the Spanish reign was on a lower rank than the German mining of the medieval times. The Mexicans must be

credited, however, with developing the amalgamation of ores; but even this branch is not fully developed to-day. It must be admitted that the Spanish Government tried eagerly to increase mining operations. By the decree of May 4, 1774, a society of competent miners was formed ("el importante Cuerpo de la Minería de Nueva España"), who were to study the same. At the same time a mining school was created in Mexico (*El Colegio de la Minería*) with large funds. This institute affected Mexican mining very much and would have regenerated it. During the Spanish domination mining was not at all influenced by the Government. The proprietors of the mines could operate their properties as they liked, and they did it in a barbarous manner; they worked their mines selfishly without any regard to the public welfare.

"In the war of independence the fanatical Mexicans destroyed all the Spanish acts, the good ones as well as the bad ones. The *Cuerpo de la Minería* existed in name only, and the mining school was deprived of all its funds. The first presidents of the Republic tried to repair the damages done during the war of independence and made wise provisions, such as lower taxes, no tax on quick-silver, free import of machines, patronage of foreign societies, etc. However, under the rapid change of governments not much was accomplished.

"Without the help of the Government, mining activities recovered by reason of the immense amount of capital brought to Mexico in 1820 to 1830 by foreign mining companies. I cannot understand, however, why these English and German companies lost their millions in but a few years. The mines could not have been the cause of it, for most of them yielded splendid results later, under more unfavorable political circumstances. Unfortunately at that time peculiar ideas were prevalent in Europe as to Mexico, where the Spaniards had won millions; the German and English miners thought they would find heaps of gold and silver. Everywhere expensive plants were erected; by the time the technical directors were persuaded that solid gold and silver is very seldom found and that it is not so easy to mine in the Mexican Cordilleras, far from civilization and without aid of proper tools and machines, and that all energy and endurance must be limited to a few single points, the capital of the companies became exhausted and the work deemed necessary could not be done. Several mines were left in the hands of a few officials who had become efficient in the service of the company; these mines were well managed and paid well. In such districts (especially where the Germans continued operations, namely, in Agangoo), mining was properly executed.

"The Anglo-Mexican Company in Guanajuato also worked in many other districts and brought undeserved discredit to mining in that locality, especially the large mine of Valencia. This company lost over a million pesos in Valenciana, Taca, Secho, and Mellado. All these mines have since paid well and in the future they will produce most of the silver minted yearly in Guanajuato; this company inaugurated the first steam engine in Guanajuato, but this machine, on account of its inefficiency, caused an aversion for steam-engines in that camp."

AMBER IN BURMA.—Burmese amber has a rich color, is hard, and takes a beautiful polish. It is mined in the most primitive way, as indeed is almost all kinds of mining done in that quaint country of rich resources. Usually amber mining is done by Burmese who have finished their harvest work and have nothing else to do. Small parties form and dig down near to where amber has been found. One man digs and another hauls up the dirt with ropes, each taking his turn at the bottom.

Mechanical Treatment of Gold Ore.

Written for the MINING AND SCIENTIFIC PRESS
By W. J. ADAMS.

Since 1898, when I published 'Hints on Amalgamation,' there have been many changes and improvements in the methods of working gold ore. The actual handling of the quicksilver, the cleansing of it, and the use of it in amalgamation, however, have not been improved, in the methods then and now in vogue; but the changes consist of mechanical improvements of all the machinery then in use, and most radical departures from old methods in the subsequent treatment of the tailing from the gold-saving plates. No new dressings or washes for plates are known, nor has any change in the types of concentrators been invented, except that of magnetic separation, and that of flotation.

Of the mechanical changes, there have been several in the standard type of battery construction. The Utica mortar increased the capacity of stamps from 3 to 5½ tons per 24 hours per head, by the addition of steel liners to the back and sides of the interior of the mortar, so that the shoes just have clearance.

Concrete mortar-blocks almost entirely replace wooden ones at the present time. The Standard mill will now also have mortars of low height, through the cover of which the 'boss' or stamp-head passes; the guides are iron or steel rings, the lower one just clearing the stamp-head; the stamps are hung up from the battery floor, either singly or as a whole by the turn of a lever; the cams do not require key-seats and can be released by the tap of a hammer; the pulleys can be unscrewed, or their hubs released in the same way as the cams; and the tappets are constructed on scientific principles, so that the bearing is all over the circumference of the stem.

Magnetic separation need only be mentioned, as it requires dry pulp, and probably a flaming roast; and is hardly applicable on the tailing of a wet-crushing mill. So far, in gold practice it has been employed only on deposits of black sand.

A process for separating the metallic sulphides was patented, using crude oil on the wet pulp, but was only feasible for a few ores, carrying slimed minerals. Then a process, employing an acid with the pulp, was also found adaptable to the flotation of minerals from their gangue. These two methods were combined, and in addition, the flotation was aided by a partial vacuum; and now it has been found of high efficiency on all ores requiring concentration, with a low working cost.

One very radical change has been made in the comminution of the sand. Previously the idea was to make the least possible amount of slime; now it is to grind all the pulp to slime, on account of the more complete extraction by cyanidation. Therefore, all the pulp, after the free gold is saved, is now reground. At first, tubemills were the only machines used, but their high first cost, expensive flint-pebbles, and the power required to run them, are now turning the attention of operators to other forms. Grinding-pans of the amalgamating type are more expensive in power and require outside screening, and their use has been abandoned. The Chilean mill has proved itself equal in capacity, cheaper to run, and with a more uniform product, as demonstrated in a competitive test at the Lluvia de Oro mine in Mexico. In fact, in many cases the subsequent cyaniding of the tailing has not been required, owing to the more complete amalgamation of all the free gold, and the sizing of the pulp, which insures complete separation of the metallic contents by the concentrators. A 10-ft. Chilean mill replaces 20 stamps, amalgamates even the rusty gold, as well as the flour gold; crushing all the ore, so

that 90% will pass through a screen with 100 holes per linear inch. It is cheaper to install than stamps, uses less than 5 hp. to run, requires little care, and has an exceedingly small loss in wear and tear.

Looking over the above, it is seen that there are now several processes of merit in place of the single one of the last decade. There is then no reason why any ore should be determined as too refractory and base for profitable treatment in these times. If you have a large deposit with low value in free gold, a matrix that is heavy, such as barite, for instance, use the vacuum flotation method. If you have a small mine, not capable of producing more than 100 tons per day, where the gold is fine or rusty, water is scarce, and power and freight expensive, use a Dodge breaker, crushing to ½ in., a Lane or Chilean mill, and belt-concentrators.

The Prospector.

Enquiries sent to this department are answered free of charge, if submitted by subscribers who are not in arrears. The full name and post-office address of the sender must be given, otherwise no answer will be made. Those who are not subscribers must accompany their questions with a fee of \$3 for each question. No assays are made.

The rock from Jerome, Ariz., marked J. C. S., is Serpentine.

The specimen marked M. M. Co., from Salt Lake City, is Granodiorite.

The specimen received from M. J. S. of Palomas, Ariz., No. 6 is Cuprite and Malachite in Quartz.

The three rocks from W. M. W., of Pine, Idaho, are from a pegmatite vein and contain oxidized Pyrite.

A specimen of slate, containing Galena, Calcite, and Sphalerite was sent by P. N. M., of Wallace, Idaho.

The mineral sample from Seatington, Cal., marked L. I. R., contains the black oxide of manganese with red rhodonite.

Rocks from Placer county, marked W. H., are: No. 1, Quartzite; No. 2, Hornblende Schist; No. 3, Quartzite; No. 4, Chlorite Schist.

The samples from Lucin, Utah, marked A. E. P., are: No. 1, silicious Magnetite; No. 2, Magnetite and Feldspar; No. 3, Hornblende Schist.

The specimen marked C. L. P. of Tombstone, Ariz., is a coarsely crystalline Limestone, stained with a black oxide of manganese. It probably owes its structure to metamorphism from some near-by volcanic intrusive.

Specimens sent by G. A. D., of Nelson, Nev., are: No. 1, impure Serpentine; No. 2, Serpentine Gouge; No. 3, Galena and Chalcopyrite; No. 4, Pyrite crystals in an altered porphyry. It shows no nickel mineral. No. 5, Feldspar Porphyry with Epidote.

The small pieces from Beatty, Nev., marked W. C. P., are: No. 1, Quartzite; No. 2, Albite; No. 3 and 4, Rhyolite; No. 5, Pitchstone; No. 6, red Hematite; No. 7, compact Chlorite; No. 8 and 9, Quartz Porphyry stained by Hematite; No. 10, Pitchstone.

E. W. S., of Landore, Idaho: Bromyrite and Embolite are two bromides of silver, occurring often in silver districts where the chlorite, cerargyrite is found. The silver mines of Mexico and Chile are well known occurrences. The brom-iodo-chloride, iodobromite is a rarer mineral.

Copper Converters, Hydraulically Operated.

By G. B. SHIPLEY.

*An interesting installation of copper converters is now being made by the Mammoth Copper Co. at Kennett, California, under the supervision of C. F. Moore, chief engineer. All of the machinery has been designed to meet the most exacting conditions.

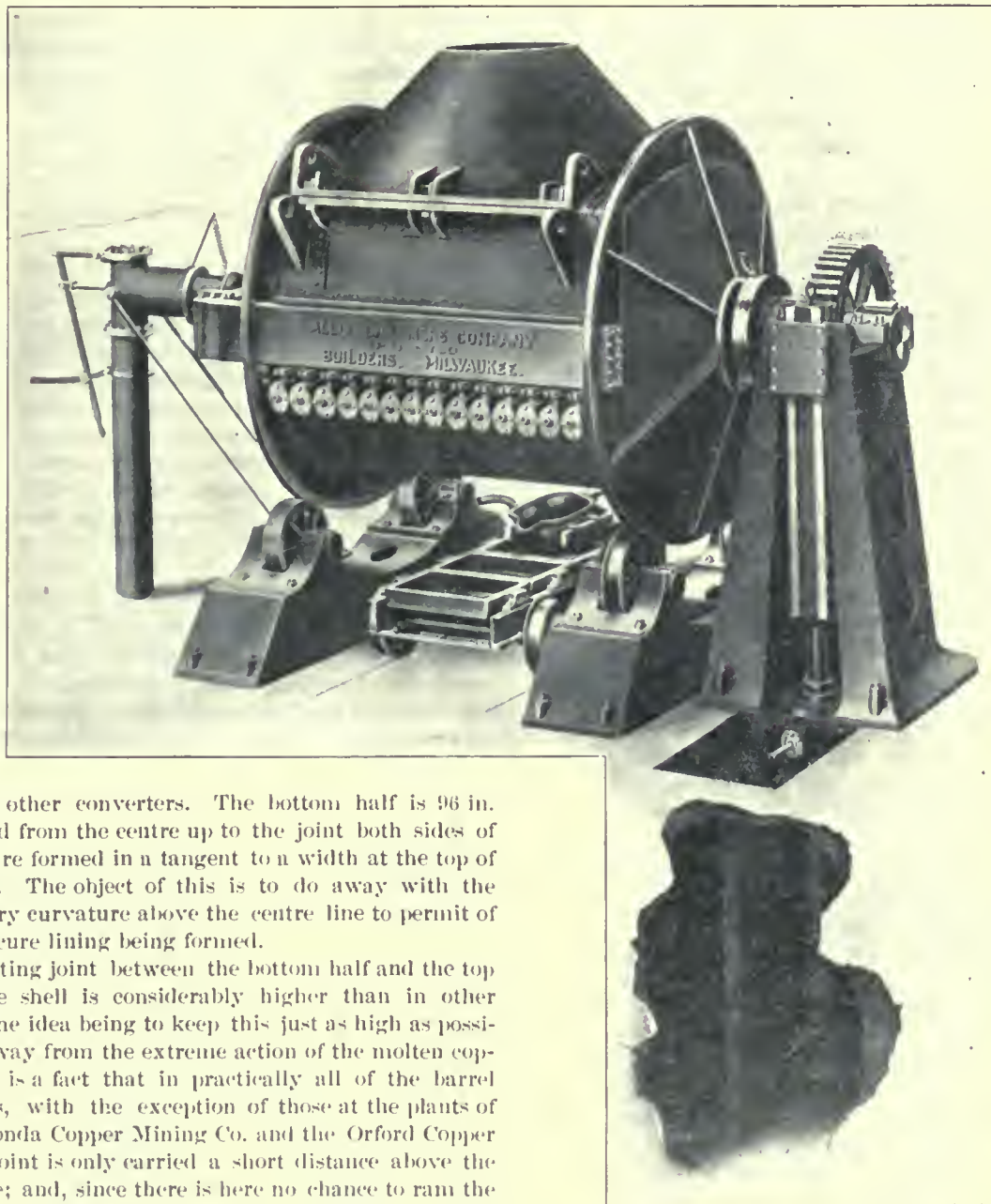
The equipment consists of two hydraulically operated stands and eight shells, 96 in. diam. by 150 in. long.

Referring to the illustration, it will be noted that the shell at the top half has a peculiar shape, which is not

intense heat. In a great many converters, designed without the ribs, much trouble has been caused and a great deal of expense incurred in fitting re-lined shells into stands which have the air connections bolted to the heads.

For lifting the shells, there is riveted at the joint on the lower half a solid cast-steel reinforcing plate, which has cast integral with it one heavy lug on each plate, making four lifting lugs in all. These reinforcing plates or angles are also arranged for bolting on the top half by three extra heavy bolts on each side.

The pouring top is made of cast-steel and is parted on



found in other converters. The bottom half is 96 in. diam., and from the centre up to the joint both sides of the shell are formed in a tangent to a width at the top of about 7 ft. The object of this is to do away with the unnecessary curvature above the centre line to permit of a more secure lining being formed.

The parting joint between the bottom half and the top half of the shell is considerably higher than in other designs, the idea being to keep this just as high as possible and away from the extreme action of the molten copper; for it is a fact that in practically all of the barrel converters, with the exception of those at the plants of the Anaconda Copper Mining Co. and the Orford Copper Co., this joint is only carried a short distance above the centre line; and, since there is here no chance to ram the lining, it is only possible to form the joint with an adobe mixture. The result is that the joint is eaten away rapidly by the molten matte. In the new type of hydraulically turned converter, built by Allis-Chalmers Co., this vital defect has been overcome by raising the joint between the bottom and top shell.

The bottom section of the shell is made of flange-steel plate, which is reinforced longitudinally by four heavy T rails and rigidly secured at both ends to a solid cast-steel head provided with a riding ring cast integral with, and completely encircling, the head. Each head is spherical in shape and reinforced with eight heavy ribs to reduce expansion and contraction resulting from the

the longitudinal centre line, thus making this part in two interchangeable sections, which is an important feature when repairs are considered. In some cases operators are in favor of fitting the top with a short cast-iron pouring-nose, which can be removed and thrown away, when eaten up by the molten metal, and another substituted; whereas there are others who insist that the separate pouring-nose is objectionable, inasmuch as the additional flanges furnish places for accretions to form. With the top as shown in the illustration, it is only necessary to rivet a steel plate at the burnt-out portion. The shape of the top of this converter, as well as the bottom, is practically the same as that of the converters in use at

*Contributed by the Allis-Chalmers Company.

Anaconda. It is a peculiar shape which gives longer life to the lining.

The wind-box is rectangular in shape, and consists of a plain casting which lies close to the shell and underneath the riding-ring, thus permitting the shells to make a complete revolution and thereby do away with the stop that it has been customary to place on a great many riding rings in order to protect the wind-box and prevent the shell from turning too far. With the old stop-arrangements it was necessary to be very careful in turning; otherwise an operator might throw the shells off the stands, thus causing a serious accident.

Another feature of the self-contained wind-box is that it does away with the long flange and cover which has always been used where the air-valves or tuyeres were fitted on the inside of the wind-box. It is well known that there is always a great loss of air through the joint in the long cover ordinarily used, because the expansion and contraction and the hard service to which converters are subjected ruins the joint.

On each of the Mammoth Copper Co.'s converters there are fitted 16 Redpath individual tuyeres, having Dyblie ball-valves, and secured to the wind-box by swing-bolts. The discharge end of each valve, which is at right angles to the inlet, projects several inches inside the shell and through a cast-steel stuffing-box secured to the shell. This stuffing-box is bored out to suit the projection on the tuyere, and is arranged for holding asbestos packing, to prevent air-leaks, while the projection inside the shell is sufficient so that a lining of brick can be fitted around it.

Each tuyere is arranged so that the ball-valve and its seat are self-contained, and the valve can be quickly taken out and replaced by another. The pipe distance-piece is also independent and easily accessible. Therefore, it will be seen that with this individual arrangement of tuyeres, it is only necessary to disconnect two swing-bolts and pull out the tuyere; it is not necessary, when replacing a single defective pipe distance-piece, to disconnect a long and heavy cover and have the great difficulty of trying to make a joint on a long and warped casting. The opinion of many will probably be that accretions will form between the wind-box, tuyeres, and shell, to such an extent that it will not be possible to get at the swing-bolts which fasten the tuyeres to the wind-box; but this is not the case, because to obviate this there is an angle on top of the wind-box, which runs for the full length and is riveted to the shell.

It has been demonstrated that the ball-valve is more satisfactory than the roller or flap-valve, because the spherical shape of the ball adjusts itself to the valve-seat, leaving no chance for grooves to form, as a result of the hard usage and constant pounding of the tuyere punching-bar. On the air end of each shell, the cast-steel head is arranged to receive the end of the wind-box, which is fitted with a ball-joint concave flange, and receives the stationary air-nipple of the patented blast-connection.

This joint is especially adapted to converters and air-joints where it is not possible to bring flanges in line, by reason of the difference in centres of shells, which are bound to become distorted and lose part of their shape after hard usage. This connection consists of a cast-iron T, having the horizontal cylinder fitted with a ball-joint and piston. When the shell is moved into position the lever is pushed forward, and this moves the nipple into the concave flange on the head. The air is then turned on, and the pressure upon the piston holds the joint rigidly in place. This joint is superior to the old method of matching flanges, and has proved to be a great labor-saving device around converter-plants.

For turning the shell each stand is provided with a pressure-cylinder 18 in. diam., having a stroke of 7 ft.,

which is equivalent to turning shells 180°. The piston is fitted with four special metallic packing-rings, which are designed to obviate leakage, wear, and the expensive delays due to repairing soft packing.

The upper end of the cylinder is secured to a flange on the bottom of an A frame and at each end are bolted independent heads. The upper head is fitted with a brass neck bushing and a well proportioned stuffing-box. It will therefore be apparent that with this arrangement it is possible to take the piston and rod out through the top, which is a desirable feature.

The driving-stand is a solid cast-iron box section A frame with liberal bearing surface at base, which is arranged for securing to foundation with four 1½-in. bolts. The upper portion of this driving-frame is designed to receive the turning mechanism, which consists of a cast-steel rack and cast-steel shrouded spur-gear. The rack is connected at the lower end to the piston, and opposite to centre line of shaft at the upper end a guide is arranged, with a well proportioned sliding surface. Thus it will be seen that the turning motion is transferred from the piston and rack to the gear.

The gear is keyed to a hollow-steel shaft which has fitted to its driving end a universal coupling, arranged so that the shells will rest true on the rollers and that at the same time the drive will adjust itself to suit the alignment, thus avoiding any undue strains on the driving-shaft. On the head of the shell is a groove, which matches a tongue on the universal drive; the main gear is turned around until the tongue is vertical, when the shell is placed, and there is clearance enough on each side of the tongue for keys, which are tapped into place by a light hammer, thus holding the shell rigid to the universal connection.

In some converters this groove on the shell has only sufficient clearance to allow the shell to drop over the tongue, and no provision is made for using the keys, in which case there is danger of a back lash, due to the clearance and the fact that the piston will have a chance to accelerate before it picks up the shell, the result being a severe shock, detrimental to the gears.

There is a sheet steel housing for each frame, which covers the driving gear to prevent dirt from getting into the operating parts.

An important detail in connection with the pouring of a converter is to obviate spatter or spilling of the copper upon the floor, and to prevent this there is furnished, when requested, a Bennetts' pouring spoon, hung on a steel arm on one side of the roller-stand as may be seen from the cut, with the arm so arranged that the spoon can be adjusted to suit the pour of copper from the shell and the position of the molds which rest on the truck directly underneath.

The following data in relation to these converters will be of interest:

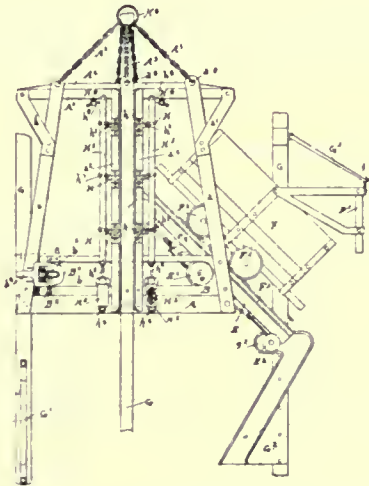
Weight of shell.....	19 tons
Weight of lining	44 "
Total.....	63 tons
Concrete in foundation.....	1,200 cu. ft.
Capacity of charge.....	40½ tonne
First charge (new lining).....	8.25 tons
Average charge.....	10.00 "
Maximum charge.....	14 to 16 "
Air-blast pressure.....	12 to 15 lb.

Assuming six charges per stand per 24 hours, and 26 working days per month, the capacity of each 96 by 150-in. converter will be about 1,250,000 lb. copper per month. Of course, this will all depend upon the matte and the conditions under which the converter is operating.

C. H. Repath, engineer of the Anaconda Copper Mining Co., F. E. Marcy, of Salt Lake, J. A. Dyblie, and B. H. Bennetts, all deserve special mention for the many features incorporated in this specially designed converter.

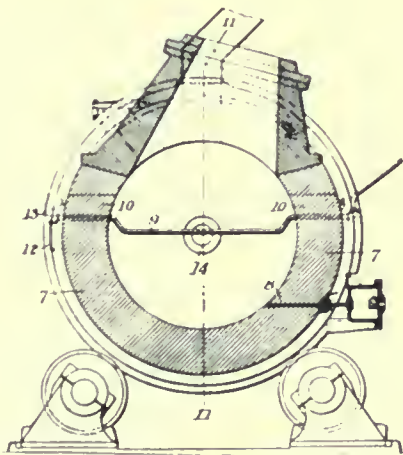
MINING AND METALLURGICAL PATENTS.

Specially Reported for the MINING AND SCIENTIFIC PRESS.

DUMPING-CAGE FOR MINE-CARS.—No. 864,813; George Trotter, Riverton, Illinois.

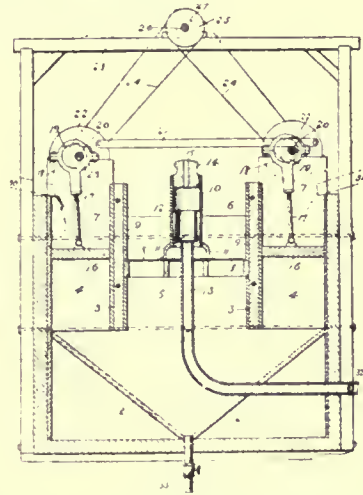
The combination of stationary channel plates having upwardly inclined ways adapted to accommodate wheels traveling in said ways, and horizontal ways communicating with said inclined ways and adapted to support wheels running within said inclined ways, a vertically movable cage, a track on said cage, a platform traveling on said track and adapted to tilt at the limit of its forward movement, wheels connected with said platform and adapted to travel in the inclined ways of said channel plates and adapted to support the front end of the tilted platform when said wheels are in the horizontal ways of said channel plates, means for connecting the ear with said platform, platform-locking devices adapted to lock said platform in horizontal position, and means for releasing the platform-locking devices immediately before the wheels on the front end of the platform enter the inclined ways of said channel plates, and again automatically locking the platform immediately after the withdrawal of said last named wheels from the inclined ways in said channel plates.

MEANS FOR PREVENTING ESCAPE OF UNFUSED ORE FROM SMELTING CONVERTERS.—No. 864,719; Ralph Baggaley, Pittsburg, Pa., Charles M. Allen, Lo Lo, Mont., and Edward W. Lindquist, Chicago, Ill.; said Allen and said Lindquist assignors to said Baggaley.



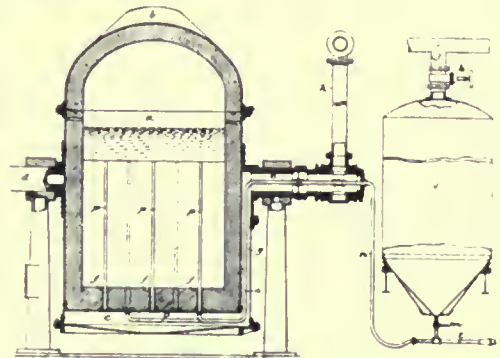
A smelting converter in which the smelting is effected by the heat of oxidation of the ore charge having tuyeres, a constantly open over-flow at one end, and a bridge or barrier placed near said opening and arranged to check floating particles of ore and submerge them in the molten bath in their movement toward said opening.

ORE-CONCENTRATING JIG.—No. 864,776; Henry Foust, Baxter Springs, Kansas.



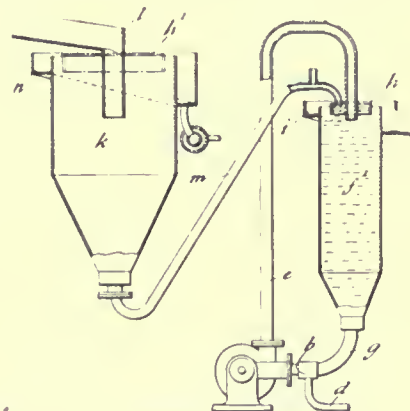
In combination, ore cells, a mesh in each of the cells, a converging bottom positioned beneath the cells, a valve casing supported by each of the meshes and held a distance thereabove, discharge pipes leading from within the valve casings to the exterior of the cells, a valve within each casing resting on the discharge pipe thereof, and means on both sides of the cell acting in conjunction with the converging bottom for forcing a liquid through the meshes.

PROCESS OF SMELTING ORE AND CONVERTING MATTE.—No. 865,333; Arthur M. Day, Bingham Canyon, Utah.



The process of smelting ore and converting matte, consisting in forcing air into the charge and injecting powdered silica or silicious material in a fluent form through one or more tuyeres with an air-blast separate and distinct from the air supply to either tuyeres.

APPARATUS FOR CONCENTRATING ORES.—No. 865,334; Alexander S. Elmore, London, England, assignor to The Ore Concentration Co. (1905), Ltd., London, England.



Apparatus for the treatment of ores with oil, comprising a mixing tank, a mixing device for intimately mixing a pulp of the ore with oil in the mixing tank, and a floating seal of oil inclosed by a ring for excluding air from the said tank during the mixing process.

Books Received.

'The Metallurgy of the Common Metals: Gold, Silver, Copper, Lead, and Zinc,' by Leonard S. Austin, Professor of Metallurgy and Ore-Dressing, Michigan College of Mines. First Edition, 1907: MINING AND SCIENTIFIC PRESS, San Francisco. 407 pp. Price \$4.

Since Tubal-Cain instructed "every artificer in brass and iron," there have been two kinds of books on metallurgy: Those attempted by half-informed tyros, and books written by men who know. This book is written by a man who knows. If he had never heard of the great school of mines at Houghton, or if the able author, who has himself contributed not a little to the progress of the art, the reader would know at first glance that this book is far and beyond the common run of metallurgical manuals.

In the first place, a good teacher of metallurgy is a rare product. He should know the theory but he must know the practice; and that means more than the few weeks of a summer vacation spent in watching others in the overalls. The metallurgist is the man who has won metals himself; the man who has met and conquered the constant challenge and corrective of business responsibility in the long and bitter task of making the ore pay for its own dressing and smelting. Professor Austin knows this, for he has done it; and his book, in every line, modestly but surely, certifies its own genuineness. The frank but terse preface tells that Professor Austin knows silver, lead, and copper from his own "practical work." That is the standpoint. It is not given to any one man to know it all; but this book is one that knows one side thoroughly. The reference to the revision of the parts of cyaniding by Mr. Bosqui enhances its value, and is only an incidental evidence of the straightforwardness of the whole treatise.

The book is primarily a textbook; but it is no borrowed abstracting of alien or unfamiliar material. This 'Metallurgy of the Common Metals' carries a clean compact outline of the general principles of the art; but all this is broadened and strengthened by constant and timely reference to the latest practice. We note the data for the calculation of furnace charges for lead, copper, and iron, the well valued cost-charges for construction and operation; and we note also some omissions which the cautious critic may well ascribe not to the oversight of the author, but to his desire to present a conservative balance of safe practice. To be sure, some subjects, as zinc, might have had a more generous space; there are the few and exasperating "errors of the first edition"—probably more annoying to the author than to anyone else; there is but scant space given to that young giant, the gas-producer (may we note that the thermal value of carbon monoxide is about as valuable as that of hydrogen itself)—the list might be indefinitely extended—but on the whole, Professor Austin has given us an invaluable digest of metallurgy in good perspective and up to date in wise business practice.

Of course, this book will at once be compared with the older textbooks and manuals; with the ambitious and often helpful Schnabel; with Hofmann on copper and lead; with Peters on copper; with Campbell on iron and steel, and with Roberts-Austen's series. With each and all of these, this book of Professor Austin holds its own, in its way and for its purpose; for it is written by a man who knows lead and copper from the practical business standpoint. There may be plenty of men who know as much as Professor Austin, even in his own line; and the modest and genuine author would be the first to acknowledge it; but the practical man rarely has the time to write such rare treatises as this is; he has not done it, he will not do it; therefore, our greater debt to Professor Austin; and the greater value of his book as compared with more pretentious manuals.

But there is one omission to which we revert with deep regret; every good book of this sort should have a good index. This book is primarily a textbook; but it will prove of great value to the old metallurgist to whom it comes in the distraction of dust and sweat and worry. This metallurgist is always a busy man, often a tired man; remember him and be patient with him. He may not always have

time or strength to search through the clear but fragmentary table of contents for the tables of costs or charges, the diagrams, the geographical helps, the hundreds of helpful facts that are sprinkled so generously through this volume. The suggestion is made with great caution, but we believe it is wise. The lack of an index would not be felt so keenly in a poor book. But Professor Austin has put the whole profession under great obligation; and, as we thank and congratulate him, we also thank and congratulate the MINING AND SCIENTIFIC PRESS for this worthy sample of bookmaking.

C. S. P.

Commercial Paragraphs.

THE MOORE & SCOTT IRON WORKS has been awarded the contract for overhauling the Mexican steamer St. Denis, bids for which were recently opened. The contract includes oil-fuel installation and complete new floors and frames under boilers and engines.

GEO. W. MYERS, for many years the Pacific Coast representative of the Chrome Steel Works, of Chrome, New Jersey, announces his return to San Francisco from temporary quarters in Berkeley. He will occupy the same offices as before the fire, 724 Kohl Building.

THE INDEPENDENT SUPPLY CO., of Napa, California, reports orders for their Maryland Georges Creek blacksmith coal from the Union Iron Works Co., Risdon Iron Works, Joshua Hendy Machine Works, Western Iron Works, and the United Railroads. For the few weeks that they have been in this field with their Eastern products they have been unusually successful and desire to call the attention of the Western mine managers to their smithing coal and invite their inquiries.

ONE of the two Allis-Chalmers 32 by 72-in. direct acting Corliss hoisting engines, purchased some months ago by the Boston & Montana Mining Co., is being erected in a building designed for the purpose close to the Tramway shaft, near Butte, for the joint use of the Rarus Tramway, Minnie Healy properties, and the Red Metal Co. The machine is a duplicate of the hoist recently installed at the Pennsylvania mine. It is of the first-motion type, weighing approximately 230 tons, fitted with automatic cut-off gear and governor, and also with complete steam reversing gear. The hoists will have a lifting capacity of 34,000 lb. per trip, from a depth of 3,500 ft. They will operate at 140 lb. steam pressure. This load includes the weight of the rope, which is over 10 tons. When working regularly at full capacity, the engines will develop approximately 2,500 hp. These hoists will be required to make from six to seven trips per hour, both night and day. While the ore from the Rarus property will be hoisted, as heretofore, through the Rarus shaft, the ore from the Minnie Healy will be lifted through the Tramway shaft—an arrangement found for the present to be most economical. From the Tramway shaft the ore will be dumped into temporary bins of 50 tons capacity, and from these, in turn, the ore will be taken by motor-drawn cars to the railway bins, which will have a capacity of 3,000 tons. The ore will be brought to the surface in skips. The Tramway shaft is now down 1,000 ft., and another 1,000 ft. will be sunk as soon as the new plant is in operation. The Rarus shaft is 1,800 ft. deep, and at the latter depth a station is being cut.

Catalogues Received.

THE CYCLONE DRILL CO., of Orrville, Ohio, has issued an artistic little booklet entitled 'Cores,' describing and illustrating its line of core-drills and combination machines handling core, hollow rod, and cable tools, and containing some valuable information relative to their operation, construction, and design.

THE J. GEO. LEYNER ENGINEERING WORKS CO., is mailing Bulletin No. 512 on the 'Model 6 Water Leyner Drill.' This is their latest type of large rock-drill, in which the number of parts has been materially reduced, and at the same time strengthened, giving the machine a longer life and reducing the cost of repair.

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TABLE OF CONTENTS

Editorial:	Page.
Notes.....	379
The Price of Copper.....	380
The Geology of Leadville.....	381
General Mining News.....	383
Special Correspondence.....	388
Butte, Montana.....	
Denver, Colorado.....	
Mexico City.....	
Cripple Creek, Colorado.....	
Leadville, Colorado.....	
Salt Lake, Utah.....	
London.....	
Concentrates.....	394
Discussion:	
Mexican Railroad Tariff.....	H. A. 395
Corrections By the Way.....	Metalliferous Murphy 2nd 395
Black Sands and the Mining Bureau.....	L. E. Aubury 396
Articles:	
Report of United States Geological Survey on Effects of the San Francisco Earthquake and Fire on Structural Materials.....	396
The Combination Mine.—I.....	Edgar A. Collins 397
The Laist & Tanner Movable Converter Hood.....	
.....	L. S. Austin 400
Genesis of the Ores of Leadville.....	S. F. Emmons 401
The Blow-out.....	F. Lynwood Garrison 406
The Cuchillo Parado District.....	R. H. Burrows 408
Improved Plunger Pumps.....	410
Tube-Mill Feed.....	410
Mining and Metallurgical Patents.....	409
The Prospector.....	407
Decisions Relating to Mining.....	399
Departments:	
Personal.....	382
Market Reports.....	382
Catalogues Received.....	410

Editorial.

OUR HONORED CONTEMPORARY *The Canadian Mining Journal* is doing a useful work in throwing the fierce light of truth on some shady mining promotions in Ontario. The activity of prospectors in that part of the Dominion has been made the cloak for much feline finance. We wish the *Journal* success in its public-spirited endeavors.

FINANCIAL CONDITIONS at London, especially as regards mining, are gloomy. Bankers are curtailing credits, in the expectation of a monetary crisis in October. Everyone is trying to liquidate, this being the logical result of the great absorption of capital in new enterprises all over the world during the last three or four years. But industrial conditions are not radically bad and the speculative public will recover a normal tone after a little physisic.

WE HAVE RECEIVED a letter commending the list of recent papers and books on mining and metallurgy that appears in the monthly bulletin of the Institution of Mining and Metallurgy. The commendation is well deserved. Such indexes are convenient and useful. Several of our contemporaries print something of the kind, but the value of them is greatly lessened by the fact that they are incomplete, and not always judiciously selected. In the meanwhile, with the help of the earnest men of the profession, we hope to publish the articles for the other fellows to index.

DESCRIPTIONS of celebrated mines, stating their geological structure and the mining methods employed, are always of value, and when they are written by the managers themselves, articles of this kind possess an additional interest. Such is the contribution on the Combination mine, at Goldfield, Nevada, written by Mr. Edgar Collins, who was manager until recently, when he became superintendent of the Montana-Tonopah mine in the neighboring district of Tonopah. The Cornish say: "A good bal makes a good captain," the last word being abbreviated to "cap'n." Conversely, a good captain can make the best of the opportunity to develop a highly successful mine. At Goldfield the combination was a fact as well as a name.

THE DAILY PRESS makes a lovely fricassee of geological information whenever it tries to be technical. For instance, it is stated in a San Francisco paper that: "A trench averaging five feet in depth and 100 feet long has exposed a huge quartz ledge with a hyperite capping fully forty-five feet wide, flanked on the west by a black basalt dyke and on the east by a vast deposit of lode porphyry, thus embracing perfect geologi-

cal conditions for a wonderfully rich gold mine." Of course, 'lyperite' is highly indicative of rich ore and a black basalt dike is a sure thing in the way of favorable rock formation, but not nearly so useful as an argillo-arenaceous matrix of a tufaceous character, sprinkled with a metasomatic replacement and peppered all over with the highly indurated remnants of the Paleozoic age. That is what you want; and then to be sure that there is the making of a good mine, ascertain how much gold there is in an average ton of the 45 feet of quartz.

The Price of Copper.

COPPER is having a sinister influence on the stock market because a noteworthy portion of the recent speculative debauch took the form of gambling in copper mining shares. We are now having the reaction. Apart from this, a collapse in the price of the metal was bound to come in consequence of the wholly irrational attempts to peg copper at a price determined by one or two metal-selling agencies. This has been tried before, with like results. During the European trade reaction in 1891 the Amalgamated people tried to keep copper at 17 cents, only to find that the law of supply and demand was too much for them; they resembled Mrs. Partington, who tried to mop the incoming tide. Much in the same way and with the same spirit, in the early part of this year, copper was 'marked up' by a handful of metal speculators to 25 cents; when the production began to increase faster than the consumption, they refused to budge until the market ran away from them, so that in August the price was put at 18 cents. Just before this was done H. H. Rogers of the Amalgamated Company had made a public statement that the price was "fixed" at 22 cents. At that date, not two months ago, Phelps, Dodge & Co. were quoted as saying that 18 cents was a bedrock price and that the market would strengthen. The *Paris Temps* said oracularly that the price of the metal "is not likely to fall below £80 per ton," this being the equivalent of 18 cents per pound. The *Economiste Française* echoed this assertion. Meanwhile excessive speculation all over the world caused a temporary financial stringency, preventing the expansion of enterprise and causing a decrease in the demand for the metal. This economic fact made the metal authorities look foolish. Unable any longer to stem the tide, the Amalgamated sold a lot of metal at 15 cents when it was quoted at about 17, and, finally realizing the condition of the market, the directors ordered a curtailment of production at the mines. The daily press stated that the mines at Butte were to be closed down, but this, of course, was an exaggeration, for to close all the mines of the Amalgamated would ruin the State of Montana and create a disaster of the first magnitude. Nor would it restore the balance, for the trouble is not so much with an excessive production of the metal as the accumulation of stock due to a mulish insistence on a price not warranted by the condition of business. Even at 15 cents the Amalgamated will make a profit, although it may not pay all the dividends expected on an inflated capitalization. It costs

12½ cents per pound to produce copper at Butte. Similarly Calumet & Hecla has decreased its quarterly dividend from \$20 to \$15. As it produces 94,000,000 lb. per annum at 8½ cents per pound, there is still a lordly profit. This is also true of Wolverine, which produces 9,000,000 lb. per annum at a cost of 7½ cents per pound, and has been the excuse for a big speculation, unmindful of the limited, though large, reserves of ore and oblivious of any such considerations as are involved in the amortization of capital.

The cost of producing copper has risen 2½ cents, or even more in places, during the last three years, by reason of the increased cost of materials and the demands of labor. Insufficiency of labor, scarcity of coke, and bad railroad management have all tended to hinder economic operations at the mines and smelters. Allowing for the shorter shift, the lesser efficiency, and the growing desire to do as little as possible for their pay, the miners are paid almost double the wages of a few years ago. Thus while the price of the metal may fluctuate, the cost of production in many cases increases steadily, despite the application of technical skill, metallurgical invention, and business sagacity.

The world's production of copper in 1906 was 715,000 tons, as compared to 700,000 tons in 1905. The normal increase is 8 per cent per annum. Expanding industry made big demands on the supply and this led to a rapid rise in the price of the metal, so that in January 1902 it was 11¼ cents and in March 1907 it was 25¼. This violent rise was due in part to economic conditions but in its extreme phase it was directly traceable to manipulation, that is, an effort to create a scarcity by withholding supplies in the expectation of forcing consumers to pay a maximum price. During the first half of 1907 the buyers and sellers kept apart, they tried to bluff each other, and the buyer got the best of it, because industrial exuberance began to wane in consequence of exorbitant demands on the resources of capital, while concurrently the slowly increasing output of copper finally produced a surplus fatal to any attempt to 'fix' the price of the metal. At the beginning of September there were about 150,000,000 pounds of unsold copper, refined and ready for consumption, as against about 10,000,000 pounds at the end of 1906. This unmanufactured copper, instead of being in the warehouses of the consumers, was on the hands of the producers. Consumers had depleted their stocks in the effort to force the producers to climb down from unwarrantable prices and they had succeeded in forcing the producers to lessen the quotation. So the price tobogganed from 25¼ in March to 14¼ last week. A collapse in the market for railroad securities, due in part to over-speculation, and in part to the Government's effort to curb corruption, caused a drain on the banks and this in turn deterred consumers from buying copper or any other supplies until the monetary conditions eased. Then came the fall in the shares of copper mining companies, until finally the different factors forced several copper mines to close down and led the directors of others to give orders for a radical curtailment of production. This is having a good

effect already. As financial conditions improve the consumers will take the copper accumulated in the hands of producers and the price of the metal will become normal, that is, it will be governed neither by panicky conditions nor by an impudent effort to fix it on the dictum of a metal-selling agency, but by the fluctuations of supply and demand. It ought to rise slowly until it reaches, say, 18 cents. But there is one factor that may cause a further recession and that is the action of the Standard Oil coterie, now under examination by the Government. These men are as anti-social as Malay pirates and as unscrupulous as San Francisco supervisors. If the prosecution now under way should drive them to the wall, they may create a panic in order to render public opinion less eager to encourage a legal pursuit. The effective portion of the community holds shares or bonds to a varying degree. Most of them are willing to see the law enforced, if it does not touch their pocket nerve. When that happens, they wince. This may be worked to the advantage of Rockefeller, Rogers, and the rest of the buccaneers. In the confusion thus created, industry would suffer, the demand for copper diminish, the price recede even to 10 or 12 cents per pound. Modern civilization is complex.

The Geology of Leadville.

IT IS PLEASANT TO TURN from the financial bog to the mountain tops of science. Assuredly if anyone wishes to breathe the strong clear air of the upper ranges of human thought, he can do so by reading the five pages we devote in this issue to an abstract from the report of the Geological Survey on 'The Downtown District of Leadville, Colorado.' It is more than a geological report on a great mining district, it is the vindication—hardly needed—of a splendid reputation and the coping stone of a nobly useful career. We have no doubt whatever as to the spirit with which this contribution to geological knowledge will be received. That large part of the mining profession which is interested in geology as applied to the exploitation of ore deposits will read the well balanced essay of Mr. S. F. Emmons with keen pleasure, and with a glad appreciation of the service he has done to Leadville in particular, and to American mining in general. Twenty-five years ago, after accomplishing a wide range of exploration in association with Clarence King and other geological pioneers, Mr. Emmons, then in the prime of manhood, undertook to decipher the complicated structure of the Leadville region. In 1882 his first report was issued, and in 1886 the monograph on Leadville appeared. It is not too much to say that this monograph was then, is now, and is likely to be for many years to come, the model for the type of treatise devoted to the economic geology of a single district. The elaborate maps have been tested by a generation of energetic miners only to become the better trusted. The illuminating explanation of the rock structure of a complex bit of the earth's exterior has been a guide to the managers of mines and a light to students of geology for 25 years. It is certain that even

as measured in the commoner unit, the monetary worth of that monograph reaches several millions of dollars, for to such an extent did it aid the search for valuable ore.

At the time of the preliminary report, the conservative statements of Mr. Emmons elicited protest from the more optimistic exploiters of Leadville's bonanzas, and objection was made to some of his views because they did not accord with the flamboyant expectations of the promoter. It was left to Alden Smith to create a cairn for his own scientific sepulture, but in 1882 the cairn was mistaken for a beacon. Between 1886 and 1890, excellent papers on Leadville were published in the Transactions of the American Institute by F. T. Freeland, C. M. Rolker, and A. A. Blow. These gave supplementary data and offered criticisms upon the work of Emmons. Finally, Posepny, in 1893, made some objections founded mainly on the misunderstandings of previous critics, the general trend of which was to impute to Emmons a narrow theory, namely, that the overlying porphyry was the source of the metals, and that Leadville was an example of ore deposition by descending solutions. As a supplementary investigation was in progress and a second report was in course of preparation, Mr. Emmons deferred his final reply to these and other criticisms. It was a fine example of a quality rare in these days of hurry—a patience that awaits the accumulation of the necessary facts. Not everyone will wait twenty years to refute his critics, nor is it given to many to be able at the end of such a period to hold the attention of his audience. Fortunately Leadville is still an important mining area, and apart from this economic condition the general interest in the theory of ore deposits has increased enormously since Monograph XIV appeared, so that for every one interested in the subject at that time there are at least a score today. And this is due in no small degree to the writer of that monograph, for his geological papers, such as 'Structural Relations of Ore Deposits,' 'On the Origin of Fissure Veins,' 'The Secondary Enrichment of Ore Deposits,' have taught a generation of mining engineers how to apply geology to the search for ore. Happily the knowledge, continental in its scope, of a thorough student of nature has been joined to a rare faculty for writing clearly, and to an instinct for the truth that has illumined the dark places of philosophic inquiry. Nor have exceptional opportunities for acquiring information led to arbitrary dicta such as kill discussion. In this respect Mr. Emmons has furthered the ventilation of new ideas and encouraged the work of younger men. The reply to his critics appearing in the Downtown Report is scholarly, for it succeeds in being both penetrating and polite. We recommend it to the imitation of the young men in the profession as a model of scientific discussion, correcting errors while affording new information, giving credit to the good points of another man's comment, while defending the accuracy of his own deductions. Leadville has given us more than its many million dollars worth of gold, silver, lead, copper, and zinc; it gave us a great geologist.

Personal.

J. R. FINLAY is in Montana.

J. H. CURLE is at Broken Hill.

CHARLES BUTTERS is at New York.

E. G. SPILSBURY is on his way to Mexico.

CURTIS H. LINDLEY has returned from Nevada.

F. W. BRADLEY has returned from Idaho and Alaska.

L. M. B. BULLOCK is at Halifax, on a visit to his home.

J. POWER HUTCHINS is here, on his return from Alaska.

BEN. S. REVETT is at Callahan, in Siskiyou county, California.

L. PARRY has gone to Russia, to take charge of a copper smelter.

LOUIS J. ABRAHAMSON has returned to London from Toronto.

W. FISCHER WILKINSON is at the Camp Bird mine, in Colorado.

F. L. COWARD has returned to Bronson, Mich., from Colorado.

W. R. FELDTMANN has returned to London from Western Australia.

E. N. ENGELHARDT has been appointed superintendent of the Selby smelter.

JOHN W. MERCER was in San Francisco on his way to the Colorado river.

ROBERT B. TODD is manager of several mines in the Goldfield district, Nevada.

FRANK W. OLDFIELD is investigating copper prospects in southern California.

C. O'BRIEN has gone from Oakland to Yreka, in Siskiyou county, California.

VICTOR G. HILLS, of Denver, is at Guanajuato, Mexico, making a mine examination.

ALFRED VON DER ROPP is expected in San Francisco on his return from Europe.

S. W. OSGOOD, of Chicago, has been examining the mines and mill of the Gould Mines Co. in Montana.

C. L. BUCKINGHAM is general manager for the Kimberley-Wilfley Mining Co. at Kokomo, Colorado.

JOHN A. BURGESS, who is with the Tonopah Mining Co., was married at Berkeley on September 25.

JOS. C. HOPPER is returning from England to San Francisco. He sailed from Liverpool on the *Majestic*.

W. A. CALDECOTT, consulting metallurgist to the Consolidated Goldfields of South Africa, is in San Francisco.

NORMAN W. PARLEE has resigned as superintendent for the Ivanpah Con. Mining Co.; he is now at Los Angeles.

EDWARD L. DUFOURCO, of New York, is general manager for the Minas Pedrazzina Co. in Sonora, Mexico; and he is there now.

FRANK PERRY, manager of the Creston Colorado and Grand Central mines, at Prietas, in Sonora, Mexico, is on a visit to New York.

C. M. FUELLER has returned to Denver from Birmingham, Alabama, and is now doing professional work at Telluride, Colorado.

THOS. A. VARDEN, of Sacramento, and JNO M. DAUGHTERTY, of Omaha, both of the American Mining & Development Co., are at Salt Lake City.

J. M. CALLOW, of the General Engineering Co., is engaged in professional work in Arizona and Mexico. He will return to Salt Lake at the end of October.

C. H. LIVINGSTONE has resigned as smelter superintendent for the Selby Smelting & Lead Co., and will visit his home at Denver before taking a position at Monterrey, Mexico.

J. H. BAKER, formerly with the United Verde Copper Co. of Jerome, Ariz., and the Old Dominion Copper Co. of Globe, Ariz., is at present superintendent of the California & Nevada Copper Co., at Daulton, California.

Latest Market Reports.

LOCAL METAL PRICES—Sept. 26.

Antimony.....	17@20c	Quicksilver (flask).....	\$38@39
Copper.....	20@23c	Spelter.....	7@ 7.75c
Pig Lead.....	4.85@ 5.80c	Tin.....	40.50@42c

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.

Date	Electrolytic Copper	Lead	Spelter	Silver
Sept. 19.....	14 $\frac{1}{2}$	4 $\frac{3}{4}$	5.10	67 $\frac{3}{4}$
" 20.....	14 $\frac{1}{2}$	4 $\frac{3}{4}$	5.15	67 $\frac{3}{4}$
" 21.....	14 $\frac{1}{2}$	4 $\frac{3}{4}$	5.18	67 $\frac{1}{2}$
" 22.....	Sunday.	No market.		
" 23.....	14 $\frac{1}{2}$	4 $\frac{3}{4}$	5.18	67 $\frac{1}{4}$
" 24.....	14 $\frac{1}{2}$	4 $\frac{3}{4}$	5.23	67 $\frac{1}{4}$
" 25.....	14 $\frac{1}{2}$	4 $\frac{3}{4}$	5.23	67 $\frac{1}{4}$

ANGLO-AMERICAN SHARES. Cabled from London.

	Sept. 18.	Sept. 25.
	£. s. d.	£. s. d.
Camp Bird.....	0 19 6	0 17 6
El Oro.....	1 5 0	1 5 0
Esperanza.....	2 0 6	2 0 7 $\frac{1}{2}$
Dolores.....	1 5 0	1 5 0
Oroville Dredging.....	0 16 6	0 16 3
Stratton's Independence.....	0 2 6	
Tomboy.....	1 8 0	1 8 1 $\frac{1}{2}$

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

MINING STOCK QUOTATIONS—NEW YORK.

Closing Prices.

	Sept. 19.	Sept. 25
Bingham Central.....	1	1
Boston Copper.....	18 $\frac{1}{2}$	18 $\frac{1}{4}$
Cumberland Ely.....	6 $\frac{3}{4}$	6 $\frac{3}{4}$
Dolores.....	5	5 $\frac{1}{2}$
El Rayo.....	2 $\frac{3}{4}$	2 $\frac{1}{2}$
Guanajuato Con.....	2 $\frac{3}{4}$	3 $\frac{1}{4}$
Giroux Con.....	5	5
Greene Con.....	18	11
Nevada Con.....	9 $\frac{1}{4}$	9 $\frac{1}{2}$
Nipissing.....	7 $\frac{1}{2}$	7 $\frac{3}{4}$
Tennessee Copper.....	29 $\frac{1}{2}$	31
Tonopah Ex.....	21 $\frac{1}{8}$	1 $\frac{1}{2}$
Tonopah-Belmont.....	2 $\frac{3}{4}$	2 $\frac{1}{8}$
Tonopah.....	11 $\frac{1}{2}$	11
United Copper.....	49	48 $\frac{1}{4}$
Utah Copper.....	21 $\frac{1}{4}$	23

(By courtesy of Hayden, Stone & Co., 25 Broad St., New York.)

SOUTHERN NEVADA STOCKS.

San Francisco, Sept. 26.

Atlanta.....	\$ 36	Laguna.....	1.30
Belmont.....	2.12	Little Tonopah.....	1.00
Columbia Mtn.....	36	Manhattan Con.....	30
Combination Fraction.....	1.72	Midway.....	80
Daisy.....	1.02	Mizpah Extension.....	10
Fairview Eagle.....	1 15	Mohawk.....	15.00
Florence.....	3.92	Montana Tonopah.....	2.60
Gold Bar (Bullfrog).....		Nevada Hills.....	4.90
Gold Bar (Goldfield).....	45	Red Top.....	3.50
Goldfield Con.....	6.62	Sandstorm.....	41
Goldfield of Nevada.....	1.30	Silver Pick.....	45
Gold Kewanas.....	45	St. Ives.....	60
Great Bend.....	46	Tonopah Extension.....	1.50
Jim Butler.....	74	Tonopah of Nevada.....	11.00
Jumbo.....	3.50	Tramp Con.....	30
Jumbo Extension.....	1.42	West End.....	65

(By courtesy of W. C. Ralston, 388 Bush St.)

COPPER SHARES—BOSTON.

Closing prices.

Sept. 26.

Closing prices.

Sept. 26.

Adventure.....	2	Michigan.....	9
Ahmeek.....	75	Mohawk.....	55
Allouez.....	23	Nevada Con.....	9
Amalgamated.....	60 $\frac{1}{2}$	North Butte.....	47 $\frac{1}{2}$
Arcadian.....	9 $\frac{1}{2}$	Old Dominion.....	24
Atlantic.....	9 $\frac{1}{2}$	Osceola.....	95
Balaklala.....	8 $\frac{1}{4}$	Parrot.....	12 $\frac{1}{2}$
Bingham Con.....	18	Phoenix.....	1
Roston Con.....	15 $\frac{3}{4}$	Quincy.....	81
Butte Coalition.....	110	Raven.....	1
Calumet & Arizona.....	645	Rhode Island.....	3 $\frac{1}{4}$
Calumet & Hecla.....		Santa Fe.....	2
Centennial.....	37	Shannon.....	10 $\frac{1}{2}$
Con. Mercur.....	58	Superior & Pittsburg.....	10 $\frac{1}{2}$
Copper Range.....	11 $\frac{1}{2}$	Tamarack.....	65
Daly-West.....	8 $\frac{1}{2}$	Trinity.....	13 $\frac{1}{2}$
Franklin.....	88	United Copper com.....	48
Granby.....	8 $\frac{1}{2}$	Utah Copper.....	35 $\frac{1}{2}$
Greene-Canaanah, etc.....	15 $\frac{1}{8}$	Victoria.....	4 $\frac{1}{2}$
Isle Royale.....	3 $\frac{1}{2}$	Winona.....	5 $\frac{1}{4}$
Mass.....		Wolverine.....	120

(By courtesy of E. F. Hutton & Co., 490 California St.)

General Mining News.

ALASKA.

A shipment of 650 tons of ore has been made from the Standard copper mine, at Landlock bay. Work was begun on this property about 18 months ago by James A. Bourke and John L. Steele of Valdez. The company is a close corporation, financed by the employees of the American Bank Note Co. of New York. A wharf, ore-bunkers, buildings, and a 3,500-ft. aerial tramway have been built and the little mine is well equipped. The property is situated 10 miles east of Ellamar, and 40 miles from Valdez.—The annual meeting of the stockholders of the Alaska Copper Co. has been held in Seattle. Pittsburg shareholders submitted a plan for reorganization, and asked for a new board of trustees to manage the affairs of the company. The proposal was adopted. The new trustees are: A. P. Burchfield, H. W. Armstrong, H. Bryson, F. C. Lane, G. L. Bond, and W. J. Post, of Pittsburg; S. H. Moore, of New York; H. T. Granger, of Seattle; and S. L. Wood, of San Diego.—A large number of laborers are coming out from Dawson, and many of them have already reached Whitehorse. An attempt will be made to induce these men to remain in the Gastineau camps, where there is a shortage of men, and where good wages prevail.

It is reported that the Guggenheims have closed down all their work in the Klondike for the winter, and will attempt to send all their employees to the Copper River country to work on railroad construction. One or two dredges are still operating, but the Atlin work has just stopped and the 170 men are out of employment, making over 1,800 idle men in the Klondike camp, most of whom are coming out at once.

ARIZONA.

COCHISE COUNTY.

A station is being cut at the 1,300-ft. point in the shaft of the Denn-Arizona, at Bisbee, and sinking has been stopped. A drift will be started to the southeast. The compressor transferred from the Shattuck is working, and oil instead of coal will be used as fuel at the power-plant.—The Shattuck-Arizona continues to ship 400 tons of ore per day, coming principally from the 700, 800, and 900-ft. levels. The winze from the 800 level of the Leo claim continues in good ore. The new compressor is supplying 15 drills underground.—The Wolverine & Arizona tunnel from the Higgins has run out of the ore and into altered limestone again, and it is possible that driving will be discontinued and work confined to the ore.—The shaft of the North Bisbee Development Co. has been retimbered and work started again; sinking, and driving the tunnel.—Most of the Superior & Pittsburg ore is coming through the Cole shaft, and there has been a slight increase in production from this shaft as well as from the Lake Superior & Pittsburg and Junction shafts.—The Copper Queen company is making no attempt at increased production, and is pushing work on the drifts toward the Sacramento shaft.

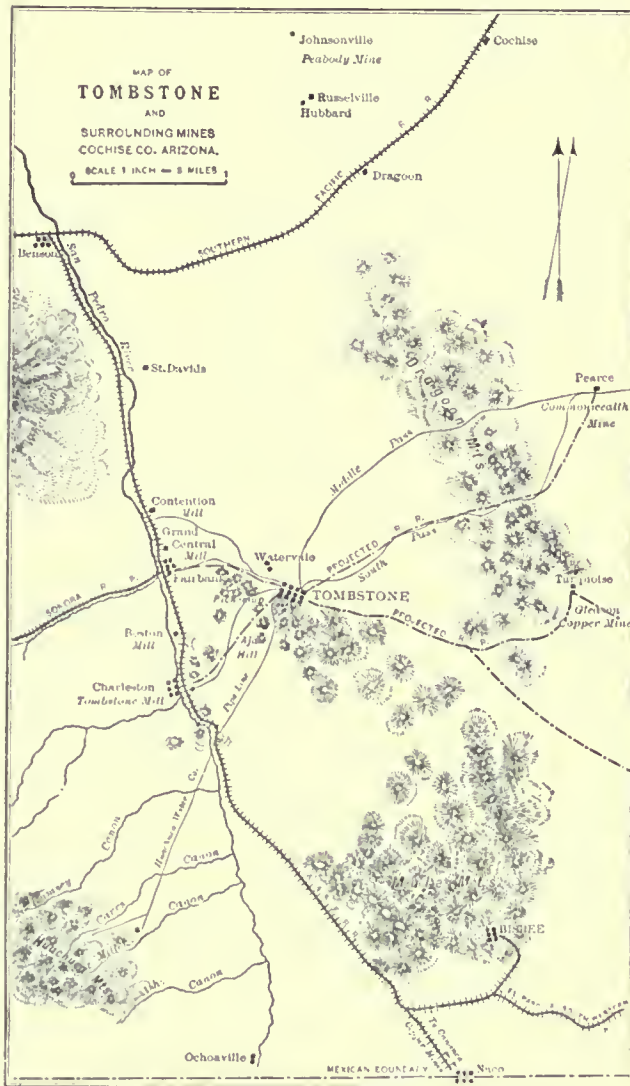
GILA COUNTY.

Five furnaces have been working at the Old Dominion smelter, making over 100,000 lb. copper per day. The cross-cut in block No. 6 on level 14 has encountered sulphide vein No. 2, while the winze from the level has reached a depth of 1,770 ft. A cross-cut will reach sulphide vein No. 1 by Oct. 30. The condition of the mine is good and 35,000 tons of coke are on hand at the smelter.—The Superior & Boston company has arranged with the Arizona Commercial Co. to start a drift on the 500-ft. level of the Blackhawk mine to develop the Great Eastern claim of the former company. The Great Eastern shaft will reach the 426-ft. point in a few days, corresponding to the 500 level of the Black Hawk, and they will be connected to aid ventilation. Sinking continues in the limestone shaft, which is down 290 ft. The drift on the 220-ft. level is still in ore. The southwest drift in the Black Oxide is in carbonate ore, 500 tons of which are on the dump.—The Arizona Commercial Co. is working 150 men. From the Copper Hill, 100 tons per day of siliceous ore is shipped, and some stoping is being done on the

500-ft. level.—While driving on No. 3 sulphide vein on the 13th level of the Old Dominion, a streak of ore was encountered that is believed to be the highest grade copper ore ever discovered in the district. While the streak is only about a foot wide, some samples taken from it assayed as high as 70% and the shoot will average in the vicinity of 40%. The ore is both glance and native copper. Another strike of native copper was reported from the mine of the Arizona National company on Lower Pinto creek.

MOHAVE COUNTY.

The Cerbat Mountain M. Co. is about to try the leasing system on the Vanderbilt mine, and hereafter all the company's mining operations will be confined to the Idaho and other properties. In the Vanderbilt the company has a large amount of ore blocked out. This piece of ground is to be let to tributors on a royalty system, while the other



Southeastern Arizona.

parts of the mine are to be let at a lower rate of tribute. The company is operating its mill at Cerbat.

PINAL COUNTY.

The Madeline shaft on the Big Lead property at Ray has reached a depth of 300 ft., and has penetrated the zone of secondary enrichment. W. B. Twitchell, the superintendent, is having a trestle constructed across Copper canyon for a car-track from the Madeline shaft to the concentrating plant of the old Kelvin Reduction Co., so that the mill can be operated on ore from this shaft. This plant will handle as much ore as does the Big Lead mill, hence inside of a few weeks the company will be milling 100 tons of ore per day and may then soon reach the dividend-paying period.

NAVAPAI COUNTY.

(Special Correspondence).—Encouraging reports of progress at the Alaska mine at Congress are heard from reliable sources. The mine is situated 2,500 ft. south of the Congress

mine, from which much ore has been stoped. The Alaska is a gold mine. Two shafts are being sunk on a vein parallel with the Congress vein. The mine was examined two years ago by Chicago engineers, who pronounced the property a good one. A test of 200 tons of ore ran \$30 per ton in gold. There are no base metals in the ore, making it easy to cyanide. The company is enthusiastic over the future of the property. The formation is similar to that of the other mine and there is every indication that the vein will go to a great depth. The Congress mine is down 4,000 ft. A new orebody has been struck in the Alaska in the past few months and more extensive operations will begin this fall. New machinery has been ordered and by April the company hopes to have in a 10-stamp mill. There are 1,000 tons of ore on the dump. The two shafts are down 400 ft. and 1,200 ft. of driving has been done. All the work has been in ore, and the vein is two feet wide. The company is backed by Eastern capital.

Phoenix, Sept. 20.

A body of gold-bearing ore was recently opened in the 500-ft. level of the King Solomon. The new find is a continuation of an ore-shoot, the longest ever opened in the mine. The pay-streak is the entire width of the drift. The drift is being pushed ahead and a cross-cut will be run to the hanging wall later to determine the size of the deposit. —On the Burrage claim, adjoining the King Solomon group, F. X. O'Brien is having a hoist installed at a 500-ft. shaft, which will be unwatered. Drifts will be run on the vein at the 500-ft. level. —At the camp of the Lookout Copper Co., in the Slate Creek district, the work of installing the new boiler and hoist recently delivered is being pushed, and the company will develop its holdings on a larger scale than ever before. Contracts for 1,000 cords of wood have been let, to be delivered as soon as possible. New buildings are being erected to accommodate the large force of miners that will later be employed. —The Buffalo-Arizona Mining Co. has a force of mechanics installing a cyanide plant at the 5-stamp mill and will develop the Parker group of mines, recently taken under bond from S. A. Parker. The group of 18 claims is situated on the east side of Turkey creek, about two miles by wagon-road from Turkey station, on the Bradshaw Mtn. The locations cover a series of gold-bearing veins, which have been developed by Parker during the past three years. He installed a five-stamp mill on the ground, where the output was treated, giving good returns before the properties were taken over by the new concern. —Extensive development is being planned by the Alma-Empire Con. Mining Co., which recently took under bond the Empire and Alma groups of mines, on Groom creek. The deal followed an examination of the Empire mine after the shaft was unwatered. The shaft, now about 400-ft. deep, will be sunk to the 600-ft. level, and the stamp-mill overhauled and some new machinery added. A pump has been ordered for the Alma shaft, which will be unwatered as soon as the pump is installed, and sunk several hundred feet deeper. The Alma and Empire groups consist of 14 claims, covering a series of gold-bearing veins that can be traced for some distance.

CALIFORNIA.

The big vertical shaft of the Kennedy, near Jackson, will be sunk from the 3,000 to the 3,100-ft. level. The 100 stamps in the new mill are running steadily, crushing about 500 tons per day. Webb Smith is the superintendent.

MADERA COUNTY.

The California-Nevada Copper Co. of Daulton within the last 40 days has shipped to the Old Dominion Copper Co. of Globe 640 tons of copper ore, carrying a high percentage of both iron and sulphur. This ore makes a valuable flux for the Old Dominion and the high sulphur is useful in matting and converting. W. C. Braw and J. H. Baker are the manager and superintendent for the company.

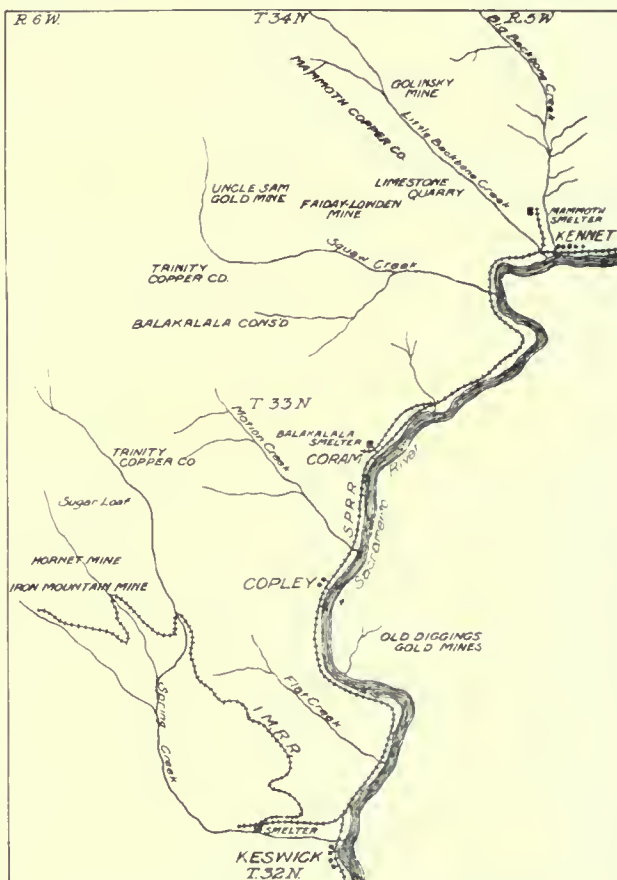
NEVADA COUNTY.

Five more stamps will be added to the 5-stamp equipment at the Republic mine. William McLean and Ed. Foss have been working the property for three years and have run three tunnels opening up a promising vein. McLean &

Co. have recently bonded the property to Eastern men, represented by F. E. Ware, who will work it on a larger scale. —The Bear River Con. Tunnel Co. has driven 200 ft. and the vein is improving. —George F. Taylor has been appointed manager of the Brandy City mines, to succeed Jason R. Leck. The company is preparing to work the old hydraulic mines on a large scale. A rich pocket has been struck in the Rainbow mine on Kanaka creek, a mile below Alleghany and not far from the Tightner. The Rainbow is owned by H. H. Noble, James Clinton, and others, and a 10-stamp mill is on the property. Murdock Morrison is in charge.

PLACER COUNTY.

Fourteen men are working in the Mameluke mine on Georgia hill. —Ernest Garrison is doing assessment work on his quartz claim below Yankee Jims. —It is reported that E. T. Roode has sold his mine at Todds Valley to New York people for \$75,000. —Tom Brown has cut the Paragon gravel in his tunnel. —A. G. Reed is running a tunnel



Map of the Copper Region in Shasta County, California.

toward gravel in the Dardenelles. —The 230-ft. tunnel in the Big Giant mine, near Clipper Gap, is being retimbered, and will be extended 250 ft. to cut the vein. Fred Dependener is in charge, and the property is owned by L. Tyler, D. Jones, and H. O. Yarrow. —W. E. Howell's tunnel, which is being run for the Louise vein near Yankee Jims, is in 250 ft., in a dolomitic country. —A tunnel is being run on the Annie Laurie, by Vere & Young.

PLUMAS COUNTY.

Cement gravel has been struck in the 450-ft. tunnel of the Piston Mining Co., operating on Spanish peak. P. C. Daniels is president of the company, and G. W. Cartwright secretary. —The lower tunnel of the Indian Valley mine is in 420 ft., but the ore-shoot will not be struck until the 300-ft. point is reached. Ore will be stoped from the upper tunnel, until the lower one is completed. Thirty men are employed, and machinery for a 20-stamp mill has been ordered, with a cyanide annex. —The Newton M. & D. Co. is operating its placer ground by using scrapers to bring the dirt to a central point, as the deposit is shallow. C. G. Norris is in charge. The North California M. Co. may work a large part of its ground in the same way.

SHASTA COUNTY.

L. D. Ball is equipping the Yellow Butte mine, east of Weed, with a gasoline hoist. The shaft is down 90 ft.—A large amount of machinery is being hauled from Redding to the Black Tom company's camp at the old Niagara mine at French Gulch. F. J. Seibel is superintendent.—The ore in the tunnel at the Vulcan mine is improving with development.—A new 30-ton locomotive has been purchased for the Mammoth Copper Co.'s Quartz Hill line.

SIERRA COUNTY.

Three groups of claims on Sierra Buttes Mtn. have been sold to Ed. S. Shanklin of Ely. The properties include the Buttes Saddle group of 12 claims, the Roman group of seven, and the two Sacred Mount claims, adjoining the Sierra Buttes quartz mine. Some development work has been done, chiefly by tunnels, and there is a 10-stamp mill on the Buttes Saddle mine that is connected with the workings by a 6,000-ft. aerial tramway. There is also crushing machinery at each of the other mines, the three giving a probable capacity of 150 tons per day.

SISKIYOU COUNTY.

(Special Correspondence).—An Eastern company is preparing to operate the Mountain Laurel mine on a large scale.—The California Con. G. M. Co. is preparing to work the Ball and King Solomon properties. The mines will be operated by electricity. The company recently purchased the four-mile Salmon River ditch.—On the Overton, five tunnels have opened up some promising orebodies. The quartz lies in slate and porphyry.—Ore is being taken from several points on the Advance. The south tunnel is being rapidly driven to tap the main orebody.—At the Homestake developments are progressing rapidly, and all the tunnels are in ore. A raise is being driven from No. 3 to connect with No. 2 and a vein was recently struck in No. 4 tunnel.

Sawyers Bar, Sept. 18.

TRINITY COUNTY.

William Montgomery and associates have bonded the Mountain Boomer mine at Denny, on New river, and commenced work in the lower tunnel, which was stopped two years ago. This mine has yielded ore for 35 years, being especially productive when owned by Ladd & Clemens.—It is reported that Humboldt people are developing a promising quartz property in the upper South Fork country.—The Brackett mine, in the Lower Springs district, owned by E. W. Brackett, has been sold to Eastern capitalists by H. O. Cummins, to whom it was under bond.—At the old Bell mine at Sunny Hill, operations are confined to cyaniding the tailing from a 5-stamp mill. As soon as enough water is available for power, work will start in the mine. This mine is owned by the Marina Mariscano Co., is well developed, has produced gold, and is superintended by L. F. Barlow.

M. P. Rose has built a new *arrastre* at his property on Coffee creek.—The Nash placer mine on Coffee creek is closed, after a successful season's run, but driving is being done in the upper workings one mile above the mouth of Union creek. This company has operated three giants all summer, and employed 15 men. Louis Maitland is in charge.—Several tons of ore have been shipped to the Kennett smelter from the Poeth mine. A compressor and Hugg water-wheel will be installed, the water being brought through a high ditch from Boulder creek.

COLORADO.

CLEAR CREEK COUNTY.

(Special Correspondence).—The Waldorf M. & M. Co. will operate the Tobin mine under the leasing system. Six leases have been granted and others are being considered.—It is announced that the Red Oak property is about to pass into the hands of a Chicago corporation for \$150,000. It is expected that active operations will commence before Oct. 1.—The Sidney tunnel sent 10 tons of ore to the smelter a few days ago, that went \$50 per ton. The ore contains silver, lead, and zinc; 15 tons are awaiting shipment.—It is reported that the new mill at the Linn Consolidated will be ready for service by the end of October.—

Development is under way at the Capital group. The east and west drifts are in 300 ft. on the Etna vein. A mill, with a daily capacity of 100 tons, is being constructed.—The Atlantic district is attracting attention.—At the Coffey a 3-ft. vein of \$50 ore has been encountered in the adit. A large body of mineralized quartz is also exposed.—A small vein of ore running high in gold and silver has been struck in the Scotia tunnel.—Two veins have been discovered on the Atlantic group, carrying gold and silver. A cross-cut will be driven to open the ground at depth. A. A. Ireland is manager.—A 16-in. vein of lead ore running \$80 per ton has been struck in the upper workings of the Paymaster. The ore carries some silver.—The Riley lease on the Sunburst is producing some silver ore of fair grade.—The Collins group has been bonded by the Premier M. & L. Co. The adit on Collins No. 1 is in 350 ft. and will be extended 300 or 400 ft. by the bonders. The bond is for \$7,000 and runs two years.—The Calla tunnel on the Ruby Argentine is in approximately 1,000 ft. and is being steadily driven forward. Where the Calla vein was cut a body of lead ore running \$25 per ton is being developed.

Georgetown, Sept. 12.

(Special Correspondence).—The Seven-Thirty Leasing Co. has taken a lease for two years on the Dives-Pelican and Seven-Thirty Mining Co.'s properties, and will put the mill in shape for handling the dump and stope-filling as soon as possible. The mill will be increased to a capacity of 250 tons per day, and a tramway will be built for transporting the material to the mill. C. M. Fueller, of Denver, will have charge of the work.—The Seven-Thirty vein has recently been cut by the Burleigh tunnel, and at the point of intersection it is about five feet wide, showing a pay-streak of from 2 to 4 in., carrying 260 oz. silver per ton, and assaying 30% lead. The Burleigh Leasing Co. is now driving both ways on the vein, in good milling ore.

Silver Plume, Sept. 17.

GUNNISON COUNTY.

There is a good deal of activity at Whitepine camp, on upper Tomichi creek. The Morning Star, which has been operated under a lease by Dodson & Dunlap, will now be worked by J. Reagan, who has bought the lease.—Tutt & Todd are shipping copper-iron sulphide ore from the Morning Glim tunnel, and advancing the Parole tunnel, now in 750 ft.—The Eureka, Nest Egg, and Erie mines are producing milling ore, concentrate from which is sold to the O. & C. smelter at Salida.

The Usona tunnel, in the Copper creek portion of the Gothie country, is developing several groups of claims in the Copper Queen basin. Air will be compressed with water-power. J. A. Goodwin is the manager.—The Coltex Mines Development Co. is operating on the Native Silver, and Gold King lodes.—A contract has been let for 200 ft. of tunneling on the Sylvanite mine, in charge of G. H. Judd.

SUMMIT COUNTY.

(Special Correspondence).—The new mill of the Kimberley Willey Mines Co. is being rushed to completion by the manager, C. L. Buckingham, as fast as material can be secured. It is estimated the mill will have a capacity of 250 tons per day. The plant is arranged as follows: The ore passes over grizzlies to 15 by 24-in. Blake crushers into bins, thence to a set of 12 by 36-in. rolls, the fine passing through other grizzlies direct to the elevator; there are five sets of rolls in all. From the rolls the ore goes to four Columbian screens. The first of the rolls reduce to half-inch, and this product goes to screens while the oversize is returned to other rolls, and this process continues until all the ore passes a 14-mesh screen. From the screens it is conveyed to the bins in the roaster building, to be delivered automatically into the furnace. The iron is roasted at a low heat and is turned into magnetite. After passing through the furnace it is elevated and passed through rotating water-cooler 30 ft. long by 4 ft. diam. This discharges onto another conveying belt, carrying the roasted ore to 10 separate bins in the main building. From here it passes through the 10 Ding magnetic separators. These take out the magnetite. The lead, zinc, and gangue pass onto

another conveying belt to a 16-in. elevator, and are discharged at the top of the mill where water is added and the gangue discharged into two Richards classifiers, making four sizes besides the overflow. Each one of these sizes is put onto two Wilfley tables, where the material is classified, making zinc, lead, and iron products. The iron product from four upper Wilfley tables is discharged onto one lower Wilfley, and the zinc, lead, and middling are handled in the same manner, thus working eight tables in a unit, four above and four below. From the lower tables the concentrate goes direct to the shipping-bins. The wash from the back ends of the Wilfley tables and the overflow from both Richards classifiers, and all of the flue-dust from the roaster is washed directly to the 30-ft. Buckingham filter and settling-tank, where it is dewatered; the thickened pulp is automatically drained off onto Wilfley tables and vanners. There will be 18 Wilfley tables and two vanners. The double roaster is the design of A. R. Wilfley, former owner of the mine and inventor of the table.

Kokomo, Sept. 18.

IDAHO.

IDAHO COUNTY.

(Special Correspondence).—The First Chance mine in Florence Camp, in central Idaho, is to be developed by a number of Grangeville men, who have organized the First Chance G. M. Co., Ltd., with a capital stock of \$1,000,000. The incorporators are J. J. Pulse, William Ingram, G. D. Smith, and W. N. Scales of Grangeville and Daniel Dunn of Florence. The First Chance consists of 10 quartz claims on the highest ground in Florence basin. The claims were located in 1895. The property has been developed by about 1,290 ft. of underground work, most of which is on three claims. The mine is equipped with a three-stamp mill with a capacity of 30 tons every 24 hours. —N. G. Turney and his Spokane associates have taken a \$30,000 bond on the Major group of four claims on American river, near the Buster mine in the Elk City district. The bond runs for one year, and first payment being due March 1, 1908. Development will be begun October 1 and is to continue during the life of the bond. The property is owned by M. Bagley and G. L. L. Baskett of Elk City and George V. Herrington of Spokane. The vein has been opened nearly the entire distance across the property by a series of open-cuts. —The Elk City, Orogrande, and Newsome districts, in central Idaho, are now entering an era of active development under the management of practical mining men. Since F. W. Bradley bonded the Buster mine at Elk City, several weeks ago, things have been moving fast. —I. C. Hallabaugh of Grangeville reports that there is every reason to believe the old Florence district will show activity in the next two years. —The French group of claims, between Newsome and the old Oregon mine, in the Newsome Creek-Elk City district in Idaho, has been sold by Peter Proux to John Leland and Eastern associates for \$35,000. In addition to the purchase price Proux is to receive 100,000 shares of stock in the company which will be formed to further develop the mine. The mine is situated in a district that has for scores of years been operated by Chinese miners, and later by Eastern capitalists. The Buster mine, recently purchased by F. W. Bradley, is within a few miles of the group.

Spokane, Sept. 12

NEVADA.

CHURCHILL COUNTY.

(Special Correspondence).—The Nevada Hills has declared the regular quarterly dividend of 10c. per share, a total of \$75,000. W. H. Webber, the manager, states that a great deal of ore is blocked out, and development is opening up new territory. The company appointed a committee to make arrangements for the construction of a railroad from Fairview to Fallon, a distance of 45 miles. —The Nevada Hills L. Co. is shipping 30 tons of high-grade ore daily to Fallon. Over 1,000 tons of milling ore is on the dumps. The lease expires Sept. 30. —On the 200-ft. level in the Fairview Eagle, the vein has widened to 15 ft. The company has ordered an air-compressor, engine, and other equipment. Water in the lower levels is causing some trouble. —A Goldfield company is arranging to operate a

lease on the Fairview Hailstone. —At the Eagle's Nest lease, some promising ore has been found. The shaft is being sunk with the expectation of reaching the sulphide zone. —Several leases are operating on the smaller properties. —Local business men are interested in a movement to build a trolley line from the town to the leading mines, also to install an electric lighting plant.

Fairview, Sept. 17.

(Special Correspondence).—The Wonder district is in excellent shape, but the future of the town depends mainly upon the Spider-Wasp and Jackpot properties. Several small properties that were regarded as bonanzas some time ago, have been closed, or are being worked on a small scale. —At the Jackpot, the shaft is down 300 ft., with a cross-cut being driven from this level to tap the main vein. A 12-in. vein of ore is being developed in the drift from the 200 level. Raises have been cut through from the 200 to the 100 level, while numerous drifts and cross-cuts are being driven on the three levels. —On the Spider-Wasp a vein of ore is being developed, and operations will soon be commenced on a larger scale. Several leases are in good ore. —At the National Wonder, the shaft is reported to be going down in ore. —At the Blue Jay, ore of fair grade is reported to be in the shaft. —The Ruby Wonder shaft is going down in ore.

Wonder, Sept. 16.

ESMERALDA COUNTY.

The Goldfield Consolidated company has declared a dividend of 10c. per share, payable October 25. —The production of the Goldfield mines for the week ending September 20 was 3,492 tons, valued at about \$400,000. This increase was expected, as the Mohawk and Combination mines are again producing. During the week there was shipped to the smelters 535 tons: to Nevada-Goldfield Reduction Works, 1,314; to Western Ore Purchasing Co., 1,139; treated at Combination mill, 504 tons of ore. The Nevada-Goldfield Reduction Works received consignments of ore as follows: Mohawk, 443 tons; Mohawk Combination, 362; Red Top, 259; Little Florence, 250; Great Western Mining Co., 22 tons. Total for the Goldfield district, 1,314 tons, of an estimated value of \$164,250. The Western Ore Purchasing Co. received ore as follows: Mohawk Jumbo, 855 tons; Jumbo Annex, 22; Hayes and Monnette dump, 60; Florence Leasing & Mining, 162; Little Florence, 40. Total, 1,130 tons, of an estimated value of \$142,375. The Mohawk mine shipped by rail 535 tons of ore that averaged \$100 per ton. —The shaft of the Rogers-Goldfield syndicate is down 370 ft. A cross-cut to the vein will be run from the 400-ft. point. The shaft on the Rosebud lease on the O. K. fraction will also be sunk to the 400-ft. point, and a cross-cut run for the vein. This property is also controlled by the Warner-Stewart people. —The Mohawk Jumbo continues to be one of the heaviest shippers among the leases of the camp. Most of the ore comes from the 400-ft. level. —The vein cut in the raise from the 385-ft. level of the Florence L. & M. Co. continues to improve. —A pump is being installed at the Gold Crown lease on the Silver Pick. Sinking will be resumed in the 200-ft. shaft. —The No. 3 shaft on the Frances Mohawk lease is down 470 ft. and bottomed in ore. —At the Goldfield Jupiter, they are cross-cutting on the 450-ft. level. —A drift is being run on the Little Florence vein at the 400-ft. level of the Combination Fraction. This vein has already been opened for 170 ft. on this level. —The shaft of the Nevada L. & M. Co. is down 500 ft. and a raise has been started from the 395-ft. level to connect with the winze that is going down from the 196-ft. level. —After being shut down for several months, the Goldfield Bulldog mine will be worked again. The property lies in the Diamondfield area, and a shaft is down 165 ft., equipped with a 40-hp. electric hoist. Matt Graham is the manager. —The shaft at the Five Friends lease on the Laguna is down 350-ft. C. U. Hyland is the manager.

LINCOLN COUNTY.

Extensive repairs have been made at the Nevada-Utah property and No. 1 shaft is ready for active work. —Sinking has again been commenced in the Susan Duster shaft of the Ohio-Kentucky company. A drift has been run on the

vein from the shaft and a winze sunk. E. L. and A. H. Godbe, shareholders in the company, have been visiting the property.—Development work on the Fortuna property in the Bristol district is opening some good ore.

NEW MEXICO.

GRANT COUNTY.

Some good bornite ore was found recently on the sixth level of the Nellie Bly mine, at Lordsburg.—The Bonney Mining Co. will start work again. Some high-grade ore is being shipped from the Misers' Chest mine.—The main shaft of the Granite Gap mine near Stein's Pass, is down 240 ft., and cross-cutting has started.—The King & Queen Copper Co. and the Kuykendall M. & M. Co. have been acquiring many of the copper claims in the vicinity of the Johnny Bull mine. F. A. Jones is the consulting engineer.

LINCOLN COUNTY.

The new cyanide plant of the Eagle Mining Co. will soon be completed. The Vera Cruz mine, managed by Ben Horner, will soon be milling ore. The mill is ready to start, with the exception of the amalgamating plates, which have not arrived.—Work on the Buster Brown copper property is being pushed by W. A. McIvers.

RIO ARriba COUNTY.

Work in the 345-ft. cross-cut tunnel of the Santa Fe has been resumed.—The Red Jacket mill will soon be run-



Map of New Mexico

ning. There has been some delay in the arrival of machinery.—The Emerald mine has been unwatered and sampled by representatives of Eastern capitalists. Levi Reynolds and Murph McKinney are the owners.

SOCORRO COUNTY.

Work on a large scale is to be started by the Rosedale M. & M. Co., owning the Great London and Rothschild properties at Rosedale, 30 miles south of Magdalena. These are old properties, with a shaft 730 ft. deep, and 14 levels.

FERRY COUNTY.

(Special Correspondence.)—The Winnipeg Mining Co. has begun shipping ore to the Granby smelter, at Grand Forks, and will continue to ship 90 tons daily.—The Colville M. & S. Co., on the South Half group, has driven a cross-cut 165 ft., starting from a point in the No. 3 adit 150 ft. from the portal, and tapped the Mountain Boy vein below the bottom of the winze, which goes down from the No. 1 adit. A raise will be made to connect with and drain the winze, when the extraction of ore from the upper workings on the vein will be resumed. The north side tunnel is in 466 ft. in heavily mineralized quartz. A test adit has

been started. The company now owns 59 contiguous claims in the South Half group, covering approximately 1,200 acres of mineral land. A surveyor is on the ground, surveying seven claims of the Mountain Boy group, and the Summit, Eureka, Blue Bird, Orphan, and Alexander claims for U. S. patents. The company will drive an adit from Gold creek, to be 7 by 10 ft. in the clear, to run 2,700 ft., cross 23 claims, and gain a vertical depth of 930 ft. From the North Half group a carload of galena ore has been shipped. A shaft is being sunk on a vein which carries an excess of five per cent iron.—An adit on the Hercules mine, at Park City Camp, is in 330 ft. At 191 ft. in from the portal a cross-cut was started on a stringer, and water is coming in. By driving the main adit 1,200 ft. farther, it would strike into the ground of the Ramore group and gain a vertical depth of 700 ft. Some of the trustees of the Ramore Mining Co. are expected from Montana, and work will be resumed on that property the coming fall. Machinery was talked of, but the Hercules tunnel may be advanced into the Ramore ground instead.—On the Independence group, near the Ramore, there is 1,200 ft. of mineralized ground between granite and porphyry. An adit has been started for its development, and an average sample from along the last 20 ft. assayed \$1 gold and 7 oz. silver per ton. About 100 ft. up the hill from the end of the adit, ore was found at the surface which carried copper and silver. One vein on the group yields rich antimonial silver ore.—The Gilroy group is being surveyed for U. S. patents.—The Amalgamated Republic Mines Co. has paid the second quarter's interest on the mortgage against the Pearl Consolidated Mining Co., which is regarded as evidence that the former will soon get its incorporation straightened out and begin operating the mines.—At Keller camp, copper in blue quartz has been struck in a 200-ft. cross-cut on the Konda mine, on Last Chance hill, at a depth of about 100 ft. The adit will be driven across the vein, when drifts will be started. At the Leonoclast the adit is still in ore.

Republic, Sept. 20.

BRITISH COLUMBIA.

The British Columbia Copper Co. will soon start development work on the Minnie Moore claim, and extension of the Emma and Jumbo claims, at Summit.—The Granby company has taken a bond on the Bullion, Keystone, and Monte groups, on the north side of Phoenix.—The Consolidated company has bonded 10 claims, some of which adjoin the Snowshoe group.—The Lightning Peak G. M. Co., of St. Paul, is doing development work on silver properties in Thunder Hill camp, 20 miles north of Franklin. About 1,000 ft. of work now stands open. The ore is shipped by pack-train to the Arrow lakes and then loaded on boats for the Trail smelter.—The payroll of the St. Eugene mine at Moyie amounts to about \$44,000 per month.—The Victoria mine near Nelson is practically closed down, only six men being employed.—The annual meeting of the Granby company has been called for October 1, at the New York office. During the year ending June 30 the mines produced about 20,000,000 lb. copper, receiving probably better than 22c. per lb. for it. The company has been paying dividends since December, 1903, 22% having been distributed in eight payments since that time.—A good stringer of ore has been found in the Rob Roy claim of the Sally group, on Wallace Mtn., West Fork.—Much of the Snowshoe ore is being shipped to the Trail smelter.—Only two furnaces are running at the British Columbia Copper Co.'s plant, and there is barely coke enough to keep them going.—An incline shaft is being sunk on the Sudbury mine at Deadwood. It is equipped with a 30-hp. electric hoist and is down 100 ft., two shifts being engaged in sinking.—Eight furnaces have been running at the Granby smelter, and about a carload of blister copper is shipped daily. There are 550 men on the company's payroll.—Fifty men are working at the Sullivan mine, near Kimberly, and 100 tons of ore per day are shipped to the Marysville smelter.—A small force of men will be employed during the winter, developing J. O. Coulthard's property on Friday creek. Diamond drilling, which has been carried on at the Nickel Plate since April, has been stopped.

Special Correspondence.

Butte, Montana.

Closing Down of Mines.—Diminution in Copper Production.—Reserves in the East Butte.—The Butte & Bacorn Co.—Butte & London.—Minnie Healey Fire.—The Bullwhacker.

It is doubtful whether the September output of the Butte district will reach 15,000,000 lb. of copper; it may be as low as 10,000,000 or 12,000,000 lb. The ordinary monthly output for several years has been around 30,000,000 lb. The official action of the directors of the subsidiary companies of the Amalgamated in ordering a reduction of 50%, or more, of the normal output, was anticipated by unofficial action, and when word was given out in New York the production had already been curtailed about 60% and the working force of miners had been reduced fully 55%. There was no cessation at that, but the reduction at all mines of the Anaconda, Boston & Montana, Parrot, Butte & Boston, Washoe, North Butte, and Coalition companies continued. A number of mines have been closed completely, including the Minnie Healey and Corra of the Coalition Co., the West Colusa and Leonard of the Boston & Montana, the Berkeley of the Butte & Boston, the Little Mina of the Parrot, and the Neversweat, Belmont, Diamond, Buffalo, Gallatin, and J. I. C. of the Anaconda. Ordinarily there are employed about 10,500 men in and around the mines of Butte. Probably 4,500 have been laid off, and more will follow. The impression here is that the curtailment will continue until there is a practical suspension of mining operations, unless in the meantime there is an improvement in the copper market. Mine managers say that under the present high prices of supplies and labor the companies can make more money by leaving the copper in the ground than they can by mining and selling it under 18c. per pound.

The East Butte Copper Mining Co. has 597,404 tons of ore actually blocked out above the 400-ft. level, according to a report made by William Clancy. On September 17 he placed a net value of \$2,987,020 on the ore in reserve. Mr. Clancy says that cross-cutting has been done to a limited degree below the 400, and a number of veins have been cut, showing relatively the same value as above, but no driving has been done below the 400, so that it cannot be said that ore is actually blocked out there, although cross-cuts have been run. For this reason no ore is estimated below the 400 in his report. None of the drifts on the 400 have been driven to the end lines. When this is done, or when the veins mentioned have been fully developed, there will be 8,352,650 cu. ft., or 835,265 tons additional blocked out. The ore above the 400 carries an average value of 3.11% copper, 2.2 oz. silver, and 30c. gold per ton. Making allowance for the veins not yet fully opened by drifts on the 400, Mr. Clancy estimates the value of the orebodies known above the 400 level at \$7,163,345. The mine is opened to a depth of 900 ft., and cross-cuts are being run on the 800 and 900-ft. levels. In line with the policy of all local mining companies, the East Butte has curtailed its operations, and shaft-sinking has been stopped for the present; the lessees are still working, though their output has been restricted, as the smelters will accept only a limited amount of ore from them. The company itself is still cross-cutting on the 800 and 900-ft. levels, the object being to open as much ore as possible in anticipation of building a large concentrator.

H. L. W. Hyde, of Pittsburg, one of the stockholders of the Butte & Bacorn Co., was in Butte last week and spent some time in examining the property. He

expressed himself as confident that the Butte & Bacorn would become a producer in a few months. He believes that commercial ore will be found at the present depth of 1,000 ft. All development and exploration work at present is confined to the Calumet claim. The drift from the north cross-cut now extends for a distance of 300 ft. eastward and is in sulphides, though commercial ore has not yet been reached. However, the streak is widening gradually and it is confidently believed that an orebody is not far distant. The water is increasing, a fact that is also encouraging. The drift from the south cross-cut is also progressing rapidly, and is in about 100 ft., disclosing good mineralization.

The local representative of Patrick Clark, principal stockholder of the Bullwhacker Mining Co., makes a denial of the report that the Pittsburg & Montana Co. has purchased a controlling interest in the Bullwhacker. Clark owns 800,000 out of 1,000,000 shares of Bullwhacker. The Bullwhacker adjoins the Pittsburg & Montana ground on the east and some of the veins in the latter extend through, or at least into, the Bullwhacker.

The Berlin cross-cut, which is being driven north from the 1,600-ft. level of the Jessie, has penetrated the ground of the Berlin claim but has not yet reached the main vein. The ground has been bad and progress has been slow. In line with the policy of all the big copper producers, the output of the North Butte has been considerably reduced, but the statements published that the mine was running low on first-class ore are erroneous. "The physical condition of the North Butte has never been so good in the history of the company," says Manager Carson. "The mines show up excellently and are constantly getting better." Others familiar with the North Butte mines say the property is 50% better now than it was when the stock was selling at \$115.

The Minnie Healey mine of the Butte Coalition Co. is again producing within about 100 tons per day of its normal output. The work at present is confined to the 1,100-ft. level and to opening the 1,300 and 1,400 levels. No mining is being done above the 1,100. When trouble was caused by the fire and gas the company had been doing some mining on the 1,000-ft. level, and that is the only work that has been hindered. No work was being done above the 1,000. Conditions in the Minnie Healey, West Colusa, and Leonard are gradually improving. By the opening of the orebodies on the 1,300 and 1,400 levels under the stipes of the 1,100, the reserves of the Minnie Healey will be tremendously increased, and the capacity to produce will be limited only by the hoisting facilities. All of the other mines of the Coalition are producing the usual quantity of ore. Owing to the reduction of output caused by the trouble in the Minnie Healey, the Coalition has not yet followed the example of other companies for a general reduction in output. The Corra mine is producing about 250 tons of ore per day. The 1,700-ft. level of that mine is being opened. The shaft has been sunk to a depth of 2,270 ft., and the shaft-work is just being completed. A station will be cut at the 2,200. A connection will be made from that point with the workings of the Diamond mine and the veins will be developed at that depth.

The damage done to the plant of the Butte & London Co. by one of the recent heavy wind-storms has been repaired. All of the big stacks had been blown down and sinking was for a while interfered with. The shaft was deepened to the extent of 74 ft. in August, and is now about 1,100 ft. deep. The company offered the shaft-men a bonus for every foot attained in excess of 70 ft. It is expected that by the first of October the shaft will be 1,200 ft. deep. It is the intention of the company

to sink 300 ft. more in addition to that before any cross-cutting and exploration is done.

Denver, Colorado.

Glenwood Springs Power-Plant.—Non-Union Men at Smuggler-Union.—Corrupt Mining Periodicals.—Lost Bullion-Spanish Mines.

The mining people of Leadville are congratulating each other on the rate of progress made by the Central Colorado Power Co. in constructing its power-plant near Glenwood Springs. A temporary plant is in operation near Shoshone falls, which furnishes the power needed for the main work. The construction of the dam at the falls and the driving of the tunnel that is to serve as the flume are both progressing rapidly. At certain times of the year the plant will use nearly all the water in the river. Some trouble was anticipated from the farmers who have taken up water-rights beyond Glenwood Springs, but this has subsided on pointing out that the power-plant does not decrease the flow, as all the water goes back into its original channel after having yielded up its energy. In fact the plant will be an actual benefit to the irrigators, for it will tend to steady the flow of the stream to some extent. Curtis & Hine is the firm that is conducting the work, while it is understood that Thomas A. Walsh, ex-Governor Herrick of Ohio, and other men are behind the project. Unlike many other plants on mountain streams, this will furnish a constant quantity of power throughout the year. The advantage of this in stimulating prospecting and development work in the outlying districts of Leadville will be great. It will be some time before the entire plant is in operation, however. In Summit county the same corporation is planning to invade the field now monopolized by another power company. The Central Colorado company is supposed to have the backing of the General Electric Co., while the rival company is in touch with the Westinghouse interests. In the lively competition that is likely to result, the consumer ought to be able to reap his full share of advantage.

Robeson & Carter have surrendered the two-year lease on part of the Smuggler-Union property, on its expiration, and the company will immediately begin to work it on company account. It was recently announced by the management that no union men would be employed. When, a short time ago, the Liberty Bell announced that the open-shop system would thereafter be employed, a large number of non-union men joined the union. It remains to be seen whether the Smuggler-Union will be able to carry out its intentions.

Colorado is especially unfortunate in the class of mining periodicals which are published within her borders. Most of these publish in their editorial columns a lot of benevolent rot concerning their solicitude in protecting the unwary investor from being imposed on by fraudulent schemes, and then devote the rest of their columns and advertising matter to boosting lost hopes and puffing barefaced frauds. A favorite and frequent dodge of these gentry is to pervert an utterance of some reputable person or body, so as to make it appear as an approval and official sanction of their schemes. In a recent issue of one of these a company whose chief asset seems to be its press agent, publishes a map from a recent bulletin of the U. S. Geological Survey, on which their locality is shown (because it happens to be a railroad station), quotes beneath it the few lines in the bulletin in

which the geological structure about their prospect hole is described, and then brazenly heads the advertisement in large letters, "Mines receive the stamp of Government approval." Such unadulterated faking can only amuse men with a knowledge of mining; but just where the editorial solicitude for the unwary investor comes in, is not clear. A little further along in the same paper is published as an advertisement a letter from a stockholder, who, on the evidence of his own statements, knows less about mining than he does about making shirtwaists, in which he gives unqualified endorsement of the claims of the promoters concerning the value of the property. Such journalism almost reconciles one to the idea of Government ownership. The Lost Bullion Mines Co., by the way, still continues to sell stock at its Denver offices to those foolish enough to want it, entirely unabashed by the sending of its promoters to jail. With the cutting off of its mail facilities, its power to defraud was also largely curtailed.

Mexico City.

The Ebano Oilfields.—Operations in the San Pedro District.—Old Dumps at Pinos.—Fall in Copper.—Wide Anxiety.—Uncertainty of the Outlook.

Edward L. Doheuey, after years of intelligent work in



Mexico.

the Ebano oilfields in the State of San Luis Potosi, has shown the extent of the deposits, and the successful use of this oil in the engines of the Mexican Central Railroad has proved, notwithstanding its asphaltum base, that it has a commercial value. He has therefore reorganized the Mexican Petroleum Co., of which he is president, increased the capital to P50,000,000, and in addition to the enormous fields around Ebano, has acquired immense tracts in the neighboring States of Tamaulipas and Vera Cruz, making a total area of several million acres. Additional wells will be driven, and after thoroughly canvassing the Mexican markets it is the intention of the company to enter the Central and South American markets in open competition with other dealers. Of the other mining interests in the State of San Luis Potosi, the Barreno Mining Co., in the San Pedro district, after a thorough test of the ore, has completed the erection of its cyanide mill and is now treating from 70 to 80 tons per day of material running about 2 oz. silver and 8 dwt. gold, the resultant precipitate being from 400 to 500 fine silver and 80 to 90 gold, the higher grade and leady iron ores being shipped to the smelter. At the Santa Rita y Anexas mine, at Pinos, a 50-ton cyanide plant is being erected by Gayan and Vaquer of Mexico City. The first cyaniding in San Luis Potosi was started about five years ago in a small way on the old dumps left from the patio

work on the ores of the San Pedro district. The treatment of these old *jales* gradually grew until now there are several plants working on them alone, besides the Barreno Co.'s new mill. At Matehuala, in San Luis Potosi, the National Metallurgical Co., under Samuel James, continues with the same success that has marked it from the first and is smelting about 500 tons daily.

The continued rapid fall in copper, which has already caused mining men throughout Mexico to concede that it may go well below 14c. per lb. before recovering, has even now led to the closing down of several small properties, put a stop to a number of important denouncements that were contemplated, and given rise to anxiety concerning the effect upon Cananea and Sonora generally. Will the Greene-Cananea Co. continue its splendid, but rather gigantic alterations? The fourth of the eight furnaces has been replaced by the larger size and is in blast, but will the others be replaced as contemplated, that the tonnage may be raised to the 100,000 tons per month, or double the present capacity? Will the price of copper cause a curtailment of the work, or will it force the company to a more rapid completion of the alterations and improvements in order to produce copper at a profit under the present market conditions? These are the questions that are being asked and the answers will be awaited with more than common interest. But it is not only the action of the Greene-Cananea, though with its 60 square miles of ground it stands well in the lead, that will be closely watched, for there are some dozen or more mines that are important factors, possibly more by reason of their ownership than of their production. First of these stand the Phelps-Dodge Indiana-Sonora and Sierra de Cobre mines, which are sending several hundred tons daily to the Douglas smelter; then the Democrata, with its own smelter at Cananea; the Arizpe Mining Co., which has just completed its 18-mile wagon-road from Cananea to Arizpe, and was contemplating a railroad and smelter for the proper development of its 10 square miles of territory, and whose Alacran and Paloseco mines are already splendid producers; the 2,500 acres known as the Cananea Nueva, north of the Greene-Cananea, just acquired by the Lewisohns from Lindsay & Talbot; the Cananea Western of C. M. Schwab; the Cananea & Bisbee of Thompson and Guggenheim; the South Cananea of the Mitchells; the Calumet & Sonora of strong Michigan capital; and the Bonanza de Cobre of Cole, Lindsay, & Talbot. How many sails will they reef in order to weather the storm? And may not some go under, or change captains before it is passed? The position is certainly claiming the attention of all, even of the small operator who is also being hurt. The end—*Quien Sabe?*

There is a good deal of activity at Guanajuato. The Mineral Development Co. has sunk the Nueva Luz shaft to 850 ft. It is intended to sink to 2,300 ft. and cross-cut at that depth, so as to cut the Valenciana vein. This is an enterprise of the greatest importance to the future of the surrounding region. The old workings of the San Cayetano are being sampled with a view to ascertaining how much milling ore is available. The shaft of the Humboldt mine is being sunk at the rate of 5 metres per week. The new addition of 80 stamps at the Bustos mill has been completed and 160 stamps are now in continuous operation, under the management of the Guanajuato Reduction & Mines Co. The San Tomas mine on the northwestern slope of Gigante is being re-opened for quicksilver ore. The Santa Elena Co. in the La Luz district has resumed operations.

The 800-ft. tunnel that has been driven on the Matulera claim of the Green Gold-Silver Co. at Ocampo, will be lengthened to 1,200 ft., which will give nearly 400 ft. additional depth on the ore.

Cripple Creek, Colorado.

Discoveries in the Isabella.—Leases on the El Paso.—Sinking the Delmonico Shaft.—Strike in the Mattie L.—Successful Leasing.—More Cyanide Plants.—Jerry Johnson Report.

The new orebodies found in the Isabella mine on Bull hill several weeks ago and the recent report of their increased size with development have caused a brisk trading in the shares. On the 10th inst. 6,500 shares were sold at 21½ cents and the next day 3,500 shares.—The larger of the mills on Ironclad hill operated by the Phoenix Co. has produced a retort of 256 oz. as the result of a 10 days run. The retort was consigned to the U. S. Mint at Denver. Low-grade oxidized ore averaging \$8 per ton was treated.—The workings of the El Paso mine on Beacon hill above 600 ft., the present water level, are to be leased. Work on company account is to cease until the drainage adit reaches the point where it will unwater the lower levels of the El Paso, which it is reported will then be operated by the company itself. The leases to be granted call for all shipments to be made to the Golden Cycle mill at Colorado City when that plant resumes operation.

Sinking the main shaft of the Delmonico mine on Bull hill is progressing rapidly on company account. The shaft is now down 850 ft. and work will be continued until a depth of 1,000 ft. is attained. The company is also making intermittent shipments of ore from the 700-ft. level. Treweek & Co., leasing between the second and third levels of the main workings, recently shipped a carload of ore valued at \$30 per ton. Their shipments average four carloads per month.—Peterson & Jones, who made the rich strike on the Mattie L. claim at the surface, are sinking on the orebody and have a shaft down 20 ft. This claim adjoins the Anchoria-Leland to the east on Gold hill. The vein has diminished in size from 4 to 2 ft. since first being struck but is still of fair grade; a carload is nearly ready for shipment.—A car of ore has been sent out by the Gold Dollar Co. from the Husted shaft of the Mabel M. on Beacon hill which settled for \$77 per ton at the Standard plant of the U. S. R. & R. Company.

The Beacon Hill Con. Mines Co. have deeded a right of way through the North Slope claim on Beacon hill to the Cripple Creek Drainage & Tunnel Co. The adit being driven from Gatch Park will pass through this territory. The grantee reserves all mineral rights.—Regular shipments are being made from the Black Diamond claim on Galena hill to the cyanide mill of the Wishbone Co. on Spring creek. This company recently obtained a lease on the Black Diamond and is breaking ore 4 ft. wide at a depth of 200 ft., which is shipped without sorting to the mill and averages \$8 per ton.—It is stated that the W. P. H. mill on Ironclad hill is to be in operation by the end of this month. This mill is being built by Groch & Woodward for the W. P. H. Leasing Co., which has a large tonnage of low-grade oxidized ore broken in the stopes of the W. P. H. property. Ore from the Jerry Johnson mine on the same hill under lease to Henry Dahl will also be treated in this mill.—The Trilby Mines Co. has practically decided upon the erection of a 100-ton cyanide plant for its property on Bull hill.

The Humphreys-Thompson Leasing Co. has shipped four cars of ore from its lease on the Little Clara of the Work Co.'s property on Gold hill; this should run about \$80 per ton. Two cars have also been sent out from the Callie claim on Gold hill, operated by the above leasing company; returns of 2 to 3 oz. per ton are expected.—On the 11th inst. the surface plant of the C. O. D. mine on Gold hill at the head of Poverty gulch was destroyed by fire, the origin of which is unknown. An estimate

of the loss is put at \$20,000, with but little insurance. The property is under lease to Cripple Creek parties, but was not being operated at the time, although the 6-drill compressor was running to supply neighboring mines with air.

The annual report of the Jerry Johnson Gold Mining Co. has been received by the shareholders. During the 12 months, 2,221 tons of ore were sold. The gross value was \$91,898, giving an average value of \$41.33 per ton. Freight, treatment, and sampling amounted to \$26,922. The main workings are under lease to Henry Dahl, who did over 5,000 ft. of development on the various levels. The main orebody is between the 300 and 400-ft. levels and varies from 4 to 14 ft. in width. It is an entirely new vein. The W. P. H. Leasing Co. is operating on the west end of the W. P. H. claim of the Jerry Johnson property through a shaft 350 ft. deep. On the 300-ft. level ore assaying from \$5 to \$24 per ton is being broken; this is to be treated by the cyanide mill (to cost \$30,000) in course of construction.—Operations through the main shaft of the Ajax mine on Battle mountain have ceased for a time. The high rates of freight and treatment on the lower grades of ore is given as the cause of the shut-down. A large amount of low-grade ore has been opened up on the various levels of the Ajax. It is stated that operations will be resumed on the completion of the Golden Cycle mill at Colorado City. This shut-down does not affect the lessees, who are working through surface shafts on the property.

Leadville, Colorado.

Increased Production.—Important Mining Deal.—Coal Prices.—Tendency to Use Electricity.—The Grand View.—A Trespass Suit.—New Orebody in the Robinson.

It is estimated that the production of the Leadville district for the month of September will exceed that of August, which was approximately 78,000 tons.

The president, W. W. Degge, and E. R. Johnston, of the Wellington Development Co., have made a deal which secures one of the largest acreages of mineral land controlled by any one company in Lake county. One of the latest acquisitions is a large group of claims in the Horseshoe district, near the Mosquito range. Among the group of claims are the Last Chance, Dauntless, and Eureka. Development work will be pushed as rapidly as the present installations will permit. It is intended to erect a new plant of machinery before the close of the present year. These claims have been developed by inclines and the dumps are valuable principally for lead and silver. A tram has been constructed to transport the ore to the Colorado Southern railroad. But of more importance than the above group, is the acquisition of the large mineral territory owned by T. S. Wood, this exceeds 2,500 acres. Some of the Wood properties have been substantially developed, while much of it has been prospected thoroughly enough to indicate its probable value. These two new additions to their property makes this company one of the most prominent of the district.

The announcement by the coal trust (Victor Fuel Co., Rocky Mountain Fuel Co., and the Colorado Fuel & Iron Co.) of an advance in price on all coals shipped to Leadville, has created considerable comment. The new rate, which has just gone into effect, is the second advance made within twelve months, and raises the price of coal exactly \$1 above the price paid by the consumer a year ago. There is but one solution of the problem as far as the power consumers are concerned, and that will be a complete change from the use of coal to electricity. As a matter of fact, the introduction of electric power by the Leadville Light & Power Co. at 12 cents per kw. has

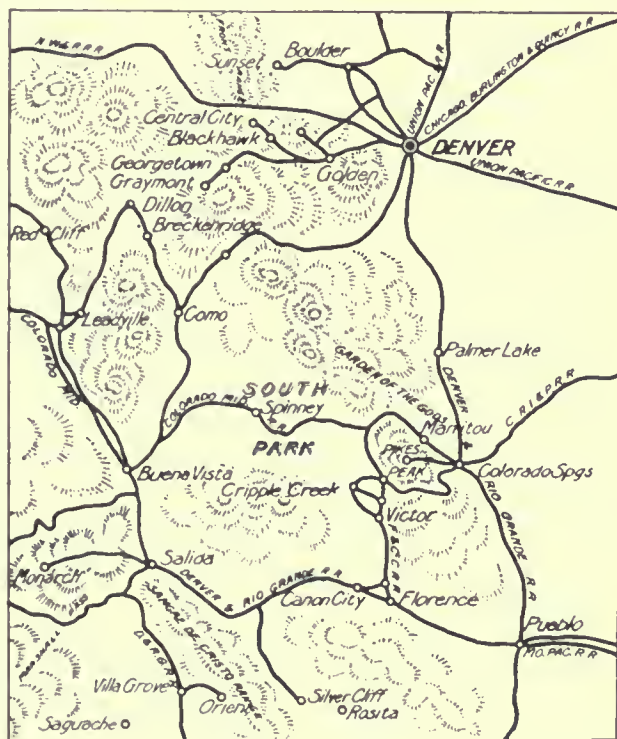
already created a favorable impression, and the advantages of electrical installations over the steam-plant, with an uncertain coal supply, is being thoroughly appreciated. In fact, a number of important installations are using electric power entirely. The whole district is looking forward to the completion of the hydro-electric plant that is to furnish power throughout the State, after which coal will only be used at mines of less importance.

The development work at the East Lake Co.'s property, under the direction of J. E. Miller, is making rapid headway. The adit is now in more than 1,000 ft. Indiana capitalists have financed a company to develop the Grand View and adjacent claims in Empire gulch. The main shaft will be deepened and a level will be driven on the contact. The ore now available is suitable for a concentrating plant, and the new company expects to erect such a mill.

Salt Lake, Utah.

Dividends.—Ore Shipments From Park City.—Annual Report of the Consol. Mercur Co.—Majestic Shuts Down.—Scarcity of Fuel.—Shipments From Tintic.—New Mills Nearly Ready.—The Western Pacific.

The Silver King Coalition has posted its usual quarterly dividend of \$187,500, which will be paid in Octo-



A Part of Colorado.

ber. The directors of the Columbus Consolidated are to meet within a few days to post the quarterly dividend of that company for payment in October also. The amount will be 20 cents per share on the issued stock—about 260,000 shares. Six mining companies posted dividends and paid them during September, as follows: Uncle Sam, \$15,000; Grand Central, \$12,500; Colorado, \$120,000; May Day, \$12,000; Lower Mammoth, \$14,250; Daly West, \$108,000.—The ore shipments from Park City last week amounted to 1,803 tons, the contributing mines and amounts being: Silver King, 621; Daly Judge, 447; Daly West, 602; Little Bell, 106; other mines, 79 tons. Preparations are well advanced looking toward the construction of a mill at Park City for the treatment of the zinc ores of that camp.

The annual report of the Consolidated Mercur Co. has been issued and shows cash on hand amounting to

\$67,454. The net profits amounted to \$14,553. Two dividends were paid, of \$25,000 each; but the year began with a balance in the treasury of \$127,195. A total of 245,169 tons of ore was mined and milled; the extraction averaged \$2.62 per ton and the loss in the tailing averaged 98 cents. Including the dividends of the DeLamar Golden Gate mine, which is now a portion of the Consolidated Mercur, the latter has paid \$3,385,312 in dividends.

Articles of incorporation of the Lion Hill Consolidated Mining Co. will be filed within a week. This has taken form as the result of the consolidation of the Chloride Point, Northern Light, and Columbia mines in the Camp Floyd, or Mercur, district.

A criminal suit has been recently filed by District Attorney Hogan, against John Ring and Helmar Ostrum, lessees on the St. Louis property, charging them with the theft of \$25,000 worth of rich ore from the Fanny Rawlings. The defendants had extended their operations from the end-lines of the St. Louis adit into the Fanny Rawlings ground. T. D. Kyle notified the offenders to cease work, which they did, but they resumed about a week later, and were arrested on the charge of ore-stealing.

The Majestic Copper Co. has ceased operations at its Old Hickory mine in Beaver county. For several months the company has been shipping a very low-grade copper ore from which a satisfactory profit was earned when the metal sold above 20c. per pound. The recent drop in copper, however, makes it impossible to operate the mine without a loss.—Electric power is rapidly taking the place of steam in several Utah mining camps and this change is being wrought much sooner than it otherwise would have done had it not been for the scarcity of fuel last winter. The Utah Consolidated at Bingham has practically all of its equipment electrically driven now and within the next few weeks the new electric haulage system will be ready. The Lower Mammoth, at Tintic, has been the latest company in that camp to make the change. When the Boston Consolidated first planned the Garfield mill it was intended to operate its own steam plant and generate its own electricity; but the management decided that it would be advantageous to buy power from the Telluride Electric Power Co., and an agreement to run for a term of years was entered into. The Telluride company operates several water-driven plants in Utah, Idaho, and Colorado.

The ore shipments from the Tintic district last week amounted to 158 carloads, the contributing mines and respective amounts being: Ajax, 3; Beck Tunnel, 11; Bullion Beck, 2; Colorado, 12; Carisa, 3; Centennial Eureka, 55; Clift, 1; Depue, 4; Eagle & Blue Bell, 12; Eureka Hill, 3; Grand Central, 8; Gemini, 5; May Day, 9; Mammoth, 9; Scranton, 7; Swansea, 1; Silver Peak, 1; Uncle Sam Con., 8; Yankee Con., 2 carloads.—A petition has been filed in the district court to disincorporate the Star Consolidated Mining Co., the property of the organization having been transferred recently to the Black Jack Co.—The management of the Utah Copper Co. has reported that the new Garfield mill has been treating ore during the current month on the basis of 100,000 tons monthly. Less complaint has been heard as to the service rendered by the Rio Grande Western in transporting ore from the mine in Bingham to the mill.—The construction of the Ohio Copper Co.'s mill, at Bingham, is progressing satisfactorily, and the contractors think they will have at least a portion of the plant ready in December. It is being constructed in four units, each to handle 500 tons.—The Boston Consolidated mill at Garfield will soon be completed.

London.

Cornish Tin Mining.—East Pool & Agar United.—Peter Watson is Optimistic.—Grenville United.—Condurrow United.—Carn Brea and Tincroft.—Dolcoath.—Elmore Process Applied.—Mr. Meyerstein's Remarks.—The Mining Market.

During August the stockholders in some of the leading Cornish mines held their general meetings in the County. In each case expressions of satisfaction with the present and hopefulness for the future were the order of the day. At the quarterly meeting of East Pool & Agar United the accounts showed in regard to East Pool a profit on £6,503. The working expenses included dues ($\frac{1}{8}$ s on all minerals) to Mr. A. F. Basset, £1,159. Wheal Agar section showed a loss of £352, consequent upon the charging of the erection of crushing plant to revenue account. The tinstuff sent to the stamps for the quarter amounted to 13,668 tons. The average produce was 23.7 lb. The sales were 144 tons 12 cwt. of black tin, averaging £118 2s. 10d.; arsenic realized £1,733, and wolfram £2,055. A dividend of 17s. 6d. on 6,400 shares was agreed to, leaving the total reserve at £7,504. The dividend is the largest since 1888, and brings up the total from July 1906 to £3 1s. 6d. per share. Incidentally, it was stated that wages were 25% higher than 18 months ago. The manager, Capt. J. Tamblyn, reported that during the last month they had increased the output from the south lode at the 70 and 90-fm. levels, and that 600 tons of stuff had been sent to the stamps, giving an assay of 28 lb. per ton. The future prospects of the mine would depend greatly upon the value of the new north lode. East, west, and at the 280 east of cross-cut they had driven 35 fm. through a lode 10 ft. wide, and the average would be 45 lb. per ton of stuff. At the 290 they had driven 27 fm. through a lode averaging 12 ft. wide and of an assay-value of 50 lb. of tin per ton. In the 290-fm. winze in the last 3 ft. of sinking the value had improved to 70 lb. and they were expecting to reach that shoot of tin on the 300-fm. level any day. The reconstructed dressing-plant at Tolvodden was a success and could not be beaten in the County for the treatment of such low-grade ores.

Peter Watson, the 'grand old man' of Cornish mining, presided at the Grenville United Mines held at the 'account house.' From a report issued to the stockholders, it is apparent that the mine has passed through a somewhat difficult period. Its former manager, Mr. Negus, left for an appointment abroad, and the new manager, Frank Williams, found various difficulties before him, which he has faced with energy and success. He is now able to show that there is a generally improved outlook for the mine, which, at the time he took charge, had not a very favorable appearance. During the half-year ending June 30, the development in the bottom of the mine proved the continuation of the principle shoot of tin to the 320 fm. west of Fortescue's shaft where its length and value have been maintained, but east of Fortescue's shaft there was no improvement, though this is expected when certain work now in progress is done. At the 305 east, after two months' stoping, the main portion of the lode was discovered above, and to the south of the level, having an assay-value of over 100 lb. tin per ton. The development of Goold's section has been fairly satisfactory, but the driving of the 130 west has been disappointing. The equipment of Goold's shaft is complete almost to 276 fm., and every effort is being made to sink and equip both this and Fortescue's shafts. The total tonnage for the half-year was 19,543 tons of black tin, producing an average of 31.78 lb. per ton; 498 persons are employed. The profit was £4,843,

out of which the directors have declared a dividend of 1s. 4d. per £1 fully paid share, and 4d. per share 5s. paid, absorbing £4,500. In his speech Mr. Watson reminded the stockholders that since he became chairman, in 1902, Grenville has divided £39,450. The manager (who is the youngest mine manager in Cornwall) foreshadowed several economies in the working of the mine. He has already centralized the dressing appliances, and he hopes to effect further reductions in working costs by rearranging the existing machinery.

The third ordinary general meeting of the shareholders of Condurrow United Mines was held under the same chairmanship. Mr. Watson said the mine was one that he remembered 50 years ago. It was then producing a large quantity of tin and continued successfully for many years. The £20 shares were selling at £120 or £130, and he believed they paid on each £20 share something like £80 or £90 in dividends. The mine was afterward worked under the name of Pendarves United. In 1868 it was producing from 40 to 50 tons of tin per month when tin was at the price of £57 or £58 per ton, half the present price. In the bottom levels they had lodes worth £30 and £40 per fathom; at the 250 they had a lode worth £90 per fm., which would be worth £175 to £180 per fm. at the present price. Regarding these facts as an illustration of the value of the property in the past he considered the present company's future as likely to be most prosperous. Great satisfaction was expressed by the meeting with the progress made in the erection of the machinery. The rate of sinking the main shaft (which is now cleared to 100 fm. from surface) did not prove a matter for so much congratulation. The chairman explained that their case was similar to that of many old shafts in Cornwall. They are carried down to a certain depth, until a bunch of tin is found, and then their course is diverted from the perpendicular, and they go down zig-zag. That was one of the Cornish methods of mining in the past century, but things are very different now. This crooked shaft it was necessary to make straight, so as to save the undue consumption of coal.

Frank Harvey presided at the fourteenth ordinary general meeting of Carn Brea and Tincroft mines, at the offices of the company. The chairman said that the expenditure during the six months had increased considerably, and also the receipts, but not quite in the same proportion. The wages bill was much higher, not owing to more men being employed, but to a higher rate of pay. Coal and materials had also increased, and royalties had advanced from £1,021 to £2,390. On the credit side, the sales of tin were somewhat less, but there was an increase in the total receipts for metals. Copper had realized less, but arsenic and wolfram more. The result was a credit on the six months of £4,518. Adding to this the balance of £5,068 brought forward from the last balance sheet, the total to credit is £9,587. From this the directors recommended a dividend of 2s. per share on the 38,607 priority shares, absorbing £3,860, leaving £5,726 to be carried forward. Since the limited company was formed in 1900, the net profits have been £34,514, and the losses £24,753. The cost for labor has averaged 17s. 6d. per ton, and for materials 28s. 11d. per ton; 953 persons are employed at these mines. The manager, Capt. Penhalls, described the prospects of the mine as excellent. He particularly mentioned the developments down the Right shaft, which revealed one of largest and richest lodes seen for years past. He had been in charge three and a half years, but the mine never looked so well as now. The chairman announced that when the ore reserves justified the action, the directors might expend some thousands of pounds on the installation of a modern plant. There is an urgent need

for a rearrangement of the dressing appliances at Carn Brea. It appears that at present the company is making a loss on every pound of tin sold, the profits being derived from by-products.

The series of stockholders' meetings was wound up, on the last day of the month, by Dolcoath, Frank Harvey again presiding. The report showed that the falling off in the quality of the ore treated in the past half-year (37.52 lb. against 39.84 lb.) was more than counterbalanced by the rise in the price of black tin, the total amount realized on sales showing an increase of £2,720 as compared with the preceding half-year, and of \$6,286 over the corresponding period. The profit for the half-year was £41,421 which, with the balance brought forward, made an available total of £57,230. The dividend, at the rate of 20% (as compared with one of 15% a year ago), absorbed £33,804. Out of the remainder £15,000 is placed to reserve, leaving £4,747 to be carried forward. The whole of the 340,000 shares of £1 each issued are now fully paid, and there are 10,000 in the treasury for future issue when required. The chairman stated that during the six months the operations underground had been pushed forward with all energy and with satisfactory results. The dressing plant and machinery had been well looked after, and added to. The Elmore vacuum plant had been erected, and was working well. They were hoping for good results from this plant. It might mean a considerable addition to their revenue in future years. The financial position of the company was really very good. A contract had been entered into for the sinking of the Williams shaft 210 fm. deeper, equipping it, and also erecting, possibly, a new stamping and dressing plant. This would absorb about £60,000 of their balance in hand, and still leave them with a good surplus. R. Arthur Thomas, the manager, said that the breakage of a pumping-rod had caused the water to rise in the bottom workings, and, in consequence, they would undoubtedly have a rather serious decrease in the amount of tin ticketed next time. There was, however, no reason for alarm. The question had been asked: Why, having such a large quantity of rich ground in the bottom of Dolcoath, the produce was allowed to decrease, to the extent of two to three pounds of black tin per ton of stuff; and why was not a larger quantity than about 2.26% of the total stuff drawn from the mine obtained from the bottom workings. His reply was that it had been possible to mine only a relatively small quantity of this ore.

E. W. Meyerstein, a prominent figure in the Cornish Consols and other financial groups, is a 'bull' on mining in the Old County. At the dinner which followed the Condurrow and Grenville meetings he is reported to have said, "there are 600 abandoned mines in Cornwall, and they will doubtless, sooner or later, be re-started. It is in Cornwall that we have the brightest outlook for the future, and this County will be the producer of national wealth for this century such as is not thought of today." In the old days the mines divided profits up to the hilt, and did not put aside anything for a rainy day; but now companies are building up substantial reserve funds. Deep mining has lost its horrors. Modern engineers face with equanimity the tasks upon which their forefathers turned their backs, and today they not only say, "Where 'tis, there 'tis," but "we'll get it out."

The last fortnightly tin 'ticketing' amounted to 215½ tons for £24,731, averaging £100 14s. 9d. per ton of black tin, an increase of 45 tons and decrease of £1 2s. per ton compared with the previous fortnightly sale. With the beginning of September the mining stock markets show signs of a possible improvement in the near future. So far, however, it cannot be said there is anything more than a promise of better times.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

PHOSPHATE rock is used altogether in the manufacture of artificial fertilizers and chemicals containing phosphoric acid.

EXPERIMENTS in cyanidation often give results not duplicated in practice because the interference of foul solutions is eliminated when working on a laboratory scale.

AT Pachuca the Patio process is preceded by fine grinding and concentration on Johnston vanners; these extract the sulphides and the gold, and the tailing from them contains the silver that is extracted by amalgamation on the *patio*.

By rubbing metals with salt, before applying mercury, the ancients obtained a reaction similar to that for which copper sulphate is used. The chlorine released from the salt formed a silver chloride easily attacked by the mercury, so as to form an amalgam.

THE eastern townships of the Province of Quebec furnish the greater part, 85%, of the world's production of asbestos. In 1906 Canada exported 59,864 tons of asbestos, valued at \$1,689,257, most of which came to the United States. The output is increasing; and in 1906 there were improvements in plant and machinery in some of the older mines, the opening up of new and promising properties, and a tendency toward a consolidation, under one management and ownership, of a number of mines formerly separately owned.

CERTAIN of the nickel alloys are used in the manufacture of electrical instruments. Nickel is one of the comparatively rare metals, and only recently has it come into wide use. It has been cheapened by the discovery of new sources of supply, and by improvements in the methods of production. It is white in color, malleable and ductile, and closely resembles iron in all its properties, with the one exception of great practical importance that it does not rust on exposure to moist air. It is this property which led to its wide use as a protection for iron and other metals which corrode easily.

THE high cost of tin has greatly concerned the makers of anti-friction metals, who have cast about for a cheaper substitute. Siemens and Halske, of Berlin, have patented a new alloy for this purpose. It is composed of 45 to 50 parts of cadmium, 45 to 50 parts of zinc, and up to 10 parts of antimony. The antimony added should not exceed 10%, as otherwise the metal is too brittle. A suitable proportion of antimony is 5%. If the proportion of cadmium and zinc is varied, the coefficient of friction increases, and the other good properties of the alloy are essentially diminished. The mixture is claimed to be superior to the ordinary white metal.

THE phosphorus obtained by most commercial processes is a crude form of the white or yellowish waxy variety, and contains sand, carbon, clay, and other impurities. These are removed in various ways—by filtering while molten through powdered charcoal or canvas submerged in water, by forcing the molten mass through porous pottery by means of steam, and by redistillation in iron retorts. The best method of purification, however, is to treat the crude phosphorus, when molten, with a mixture of potassium dichromate and sulphuric acid,

or sodium hypobromite, some of the impurities being dissolved, others rising to the surface as scum.

It is only recently that phosphorus has been extracted from mineral deposits. The mineral from which phosphorus was first obtained was phosphorite or rock phosphate, an impure fluophosphate of calcium, from which soluble phosphate fertilizer is generally made. Apatite, a fluophosphate or chlorophosphate of calcium, has been used in Europe and Canada to a small extent, but wavellite (aluminum phosphate) has not been heretofore used commercially, as far as known, in the manufacture of phosphorus, as the mineral does not generally occur in minable quantity. A deposit of wavellite at Mount Holly Springs, Pa., has recently been mined for this purpose and has been successfully reduced in the company's plant by a secret process.

A GENERAL DEFINITION for a schist is a metamorphic rock that is laminated so as to split with some ease along parallel planes. Schists grade into gneisses and their mineralogy is about the same, but crystalline schists often have finer laminations than gneisses. Schists and gneisses are the most typical and important of the metamorphic rocks, as they are the product of the most extreme alteration of both sedimentary and igneous rocks. They show great variation in texture and mineral content. A schist may be defined as a highly metamorphosed slate, which has become thoroughly crystalline, with the minerals in a parallel arrangement, while a gneiss is composed of the same minerals as granite and only differs from it in the arrangement of the minerals in bands.

BITUMINOUS rock, like any other rock, is obtained by quarrying or excavating, and is a natural mixture of bitumen and the including rock, usually consisting of sandstone or limestone. For paving or roofing it must be crushed, and for successful use the bituminous or asphaltic content must be brought to the proper consistency and quantity with respect to the stone matrix. The mastic extracted from the bituminous rock in the presence of heat and moisture naturally carries a percentage of earthy impurities, as do the malphas and viscous asphalts that occur exuding at the surface of the earth. The extracted and the natural asphalts are used largely for street paving. The natural asphalt imported from Trinidad and Venezuela supplies a large part of the eastern United States for street paving. They are refined and utilized also for roof and other metal paints.

THE name flint is properly applied only to quartz of exceedingly compact texture, dull surface, and perfectly conchoidal splintery fracture. It commonly occurs in the form of more or less irregular nodules in limestones, and in such cases is almost certainly of concretionary origin. Chert is another name applied to flint occurring in this way. Flint or chert nodules occur abundantly at several places in the United States, notably in the Cretaceous limestones of central Texas. So far as known, but little domestic flint has ever been commercially utilized except as road metal, though its quality appears to be equal to that of the imported flint. All the true flint consumed in this country comes from France, Greenland, Norway, and England and is imported cheaply as ballast. Many of the smaller round or oval nodules are used in ball-mills, but much of the material is fired in kilns and then ground for use in the pottery trade. The flints, which are usually gray to nearly black in their natural condition, become perfectly white on burning, and fracture somewhat, so that grinding is facilitated.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

Mexican Railroad Tariff.

The Editor:

Sir—The new tariff on ore contemplated by the United Railroads of Mexico, if put into operation, may prove fatal to the whole mining and smelting industry of Mexico. Before committing themselves to such a new departure it would be well for the railroads to investigate if the ore could stand this classification. As a matter of fact, the large shippers are by no means as much on velvet as the public at large assumes. Many mines today would be shut down if it was not for the advances from the smelters. Sierra Mojada, for instance, is shipping large tonnages of low-grade ore almost indispensable for smelting, although the returns are small.

As far as the smelters are concerned, the ore has not been a source of profit for several years. Smelter rates in Mexico are lower on all classes of ore than ever before, this being due not only to keen competition, but mainly to maintain the tonnage in lead, copper, and fluxing ores. The net margins of the smelters are at the limit, particularly with an uncertain coke supply, not to mention the price of it, at \$22 per ton. Many silicious ores now available for smelters, could not be shipped under the new tariff.

Beyond question, the tariff will be farther reaching than anticipated. Judging from the yearly statement of 1906, the increase will be more than 60%. Many large shippers cannot stand the increase and must shut down their mines. It is a case of killing the goose that laid the golden eggs. With a particularly tight financial situation all over Mexico, this new tariff is inopportune, and we may venture the hope that this matter may be deferred until more thoroughly examined.

H. A.

Torreon, Mexico, September 12.

Corrections By the Way.

The Editor:

Sir—I am weary with seeing in your paper many articles which assume that mining is a business, when anybody that knows anything about precious metal mining knows that it is nothing of the kind. Now I am not going to take up your crowded columns with elementary definitions as to what constitutes business, gambling, and mining, but I will boil it down to the statement that there is not today on this planet a single mining camp where a man can take \$10,000 and invest it in a mine without running the danger of losing it all within a few years and with an almost positive certainty that he will at any rate lose a large portion of it. I ought to have stated in the beginning that I confine my remarks to precious metal mines—gold and silver mines—but I don't think I should be far out if I applied to all metal mines.

Some people may ask why is this thus? Very simple, because the rewards are so great that speculative capital is attracted in such amount that the prices of prospects and mining shares are put out of all reason. In 'boom' times mining shares always sell for from five to ten times what they are worth, and even in these depressed times the stocks are selling from two to five times their probable valuation by a conservative engineer, say such engineers as are employed by the Exploration Co. of London, or the Tharsis Co. of Glasgow.

As for mining engineers not visiting anything but

well-known bonanza camps; why, my dear Sir, there isn't a spot on the habitable globe from Nijni Kolimsk in Northeast Siberia to Puntas Arenas where you can't find the tracks of dozens of them and in this desert region there is a procession of automobiles chewing dust all over the State, and there isn't a square mile in Nevada undisturbed by the wandering prospector, who so far this year hasn't hit it to any great extent that we are aware, tho we still live in hopes. The money spent in prospecting and 'scouting' after mines is beyond belief; I can easily count up a million dollars spent for that purpose among a very few firms. One little expedition that perhaps five men have heard of cost \$65,000 and not as good a showing was found as can be turned up within two miles of the Cliff House.

I note too that your deep erudition has gone astray in your last paper where you talk about rhyolite with fossils in it, I think if you called it a tuff strongly resembling rhyolite, you would have been nearer the truth.

Trusting this letter may have a tendency to cast a slight Beam of the Light of Information on the Darkness Cimmerian of Unknowing Enthusiasts, I am,

METALLIFEROUS MURPHY 2ND.

Tonopah, September 12.

[We are pleased to hear from Mr. Metalliferous Murphy 2nd, for we have pleasant memories of the first of that illustrious name. It was at Salmon City, in Idaho, that we met the venerable mineralogist. Being in doubt as to the real nature of a specimen of ore found in a neighboring gulch, we referred the labeling of it to the eminent authority. He said: "It is hoighly magleferous maaterial, bedad; and its chief compoanent paarts is made up ov zinc, lead, oiron, and tin, and the oxhides of copper, and the horns of silver, and iron pirate, and the Devil knows what all; and where did ye foind it, in order that I may go and loacate it?" No wonder we are glad to hear from his illustrious successor, more particularly as this communication from Tonopah makes light so many dark places. We had heard of Searchlight, in Nevada, but we did not know that a 30,000 candle-power luminary sojourned at Tonopah. It is greatly to the gain of those who dwell in the desert. Metalliferous Murphy 2nd ought to take the place of a Carnegie library.

Next to saying what a thing is, it is well to say what it is not. Mining is not a business, says he, but a risky gamble. To this we demur. Ask the gentlemen whose ancestors were inside of Jerusalem at the time of the siege and they will tell you that not only is mining a business, it is more than that, it is a 'peeziiness.' And 'peeziiness' may be defined as a highly profitable form of human activity.

As to the high prices of mines, that is true. But if the Great Metalliferous One will throw what does service for a mind into the dim recesses of the past (which is better than a wastepaper basket) he will find that 20 years ago the price of mines was even greater proportionately to the ore reserves measurable at the time of sale. If mining is a risk today, what was it in 1880? At that time mining claims were bought on hand specimens, 'symptoms of indications,' a fine site for a dump, lovely scenery, and what not. We venture to say that nowa-days the buyer of a mine gets twice as much for his money as he did 25 years ago. Of course, there are fools that rush where experienced men fear to tread, and in boom days the simpleton is an easy prey to the promoter, but these are exceptions, not rules.

As to the money spent in scouting for mines and mineral discoveries, doubtless in the aggregate a big sum is spent, but we doubt if any form of speculation is

as remunerative in the long run when properly performed. A young bonanza is the most profitable form of mining enterprise, and the exploration companies that get hold of important ore deposits when in a youthful stage of development make lots of money.

Finally, as to the tuff. The rock was made of fragmentary rhyolite and it was rhyolite as to its composition, but differed from ordinary rhyolite in the manner of formation, being due to the interplay of volcanic and sedimentary agencies. A pig is called a pig when it looks like a pig, grunts like a pig, and has other porcine characteristics; the tuff did not only "strongly resemble" rhyolite, it was rhyolite; it was rhyolite-tuff. Our compliments to the Eminent Metalliferous One at Tonopah.—Editor.]

Black Sands and the Mining Bureau.

The Editor:

Sir—I have noticed an editorial in your issue of the 14th inst. which comments unfavorably on Bulletin No. 45, 'Black Sands,' and in which article you take a whack at the Mining Bureau. Without comment at this time on the article, I think it would be wise for you to look over the files of your journal for the past year, and read what you published regarding black sand matters. I cannot recall the exact date of the publication, but I remember that you 'roasted' Dr. Day's methods to a finish. For this reason, I cannot understand your change of heart.

L. E. AUBURY.

San Francisco, September 18.

[Mr. Aubury is mistaken as to the "change of heart," and if he will read the editorial paragraph to which reference is made, he will find that there is nothing in it to warrant the idea he expresses. We consider that Dr. Day's experiments were of no particular value in themselves, and that they did positive harm by being used in a number of prospectuses of a misleading character. They did injury to the reputation of the Survey by connecting it with flamboyant pseudo-scientific propaganda of an undignified character. But the point of our comment, to which Mr. Aubury objects, was that the pamphlet published by the State Mining Bureau was also of no particular value, and while criticizing Mr. Day, it gave no practical information of the kind that might be expected from the Bureau. It was merely a *réchauffé* prepared by a man quite capable, if so instructed, of giving something much more serviceable. Mr. J. A. Edman is experienced in such matters and if serious investigations were to be undertaken by him, the result would be a valuable report on the proper treatment of 'black sands.' Bulletin No. 45 of the Bureau is not such a report; it is a short inconsequential reference to the subject. Yes, we did take "a whack at the Mining Bureau," although we would prefer to say that a criticism was made of a State department that is doing very little at this time to warrant its existence save to take part in the game of grab between two railroad companies that are fighting over the control of land in northern California. We shall refer to this matter shortly; in the meanwhile we would like to see the State Mineralogist so directing the Bureau as to make it useful to the mineral development of California.—Editor.]

"IT SEEMS TO ME," said Lord Kelvin, "that in reality ether is structureless, which means that every portion of ether, however small, has the same electric properties as any portion, however great. There is no difficulty in this conception of something utterly homogeneous and elastic, occupying the whole space from infinity to infinity in every direction."

Report of United States Geological Survey on Effects of the San Francisco Earthquake and Fire on Structural Materials.

Within a few days after the San Francisco earthquake and fire of April 18, 1906, the United States Geological Survey arranged for an investigation of their effects on buildings and materials of construction, and the results of that investigation have just been published by the Survey as Bulletin No. 324.

The report comprises four papers: The first, by G. K. Gilbert, geologist of the Survey and member of the State Commission for the investigation of the earthquake, discusses the shock as a natural phenomenon, especially those features of it which would contribute to an understanding of the three following papers. These treat the subject from the standpoint of the engineer, and describe the effects of the shock and the fire on the various structures and structural materials.

Of the engineers reporting on the subject, Richard L. Humphrey was sent to San Francisco as Secretary of the National Advisory Board on Fuels and Structural Materials, and as a representative of the Geological Survey, in which for the last two years he has had charge of the structural materials laboratories. Mr. Humphrey's investigation began early in May, lasted six weeks, and covered the entire territory affected. Capt. John Stephen Sewell, of the Corps of Engineers, United States Army, was sent to the scene of the disaster by the War Department under order of April 23, to make an investigation similar to that undertaken by Mr. Humphrey. Before going to San Francisco he had made a careful study of the effects of fire on buildings and materials, especially as indicated by the results of the Baltimore fire in 1904. Frank Soule, dean of the College of Civil Engineering of the University of California, who prepared the final paper, had not only had wide experience with his subject, but had the advantage of being thoroughly familiar with conditions in San Francisco prior to the earthquake and of being present during and after its occurrence.

The investigations of the three engineers were conducted independently and their papers were written without collaboration, but the opinions expressed are strikingly accordant in their more important features. The report is profusely illustrated, and a list of other important papers on the same subject which have appeared in technical journals and the proceedings of technical societies during the last year is appended to it.

TRANSVAAL WAGES.—On the last day of the year, ended June 30, 1906, the Transvaal gold mines employed 17,959 whites, 90,882 blacks, and 52,352 Chinese coolies. The white employees, for the most part, are skilled laborers, and the wages earned by them during the year amounted to \$32,207,070, including the salaries of the skilled staffs. This gives an average annual income of approximately \$1,780 per employee. Wages earned by natives, Chinese, and other unskilled workers amounted to \$18,824,635, the Chinese earning \$5,506,550, the natives and other colored employees earning \$13,773,980. The average monthly wage to each worker was respectively \$9.50 and \$12.50. The total wage bill of the gold industry for the year was \$51,031,205, or almost one-half of the value of the gold output. In addition to wages, the unskilled laborers are provided free with housing, medical attendance, and food, the raw material of the last two items amounting to \$3,966,015. The value of the stores consumed on the gold mines during the last official year was \$42,485,610, which, added to the wages earned, amounted to \$93,015,315, or about 84.7% of the value of the total gold output for the same year.

The Combination Mine....I.

Early Development and Geologic Structure.

Written for the MINING AND SCIENTIFIC PRESS
By EDGAR A. COLLINS.

The Combination mine is situated in the Goldfield mining district, Esmeralda county, Nevada, about one-half mile in a northeasterly direction from the main street of the town of Goldfield.

The Combination No. 1 and No. 2 claims were located



The Combination Mine and Mill.

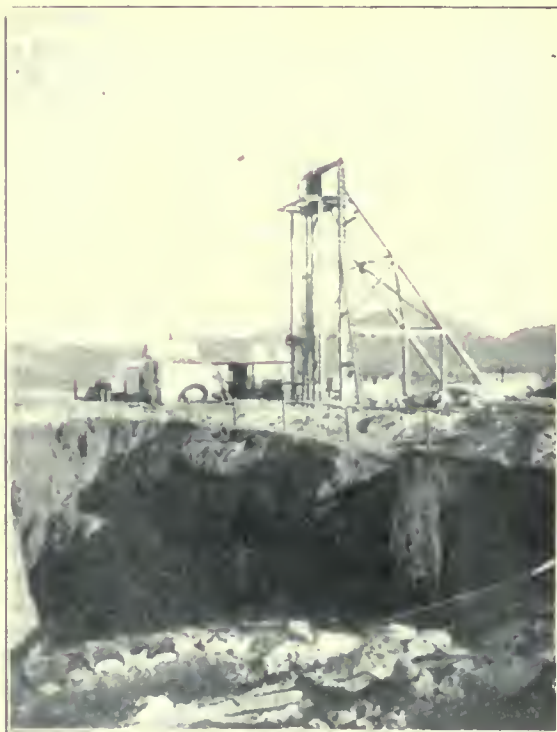
in May, 1903, and the first discovery of mineral was made soon after. In October of the same year, the group (consisting of ten claims, aggregating 175 acres) was bonded by L. L. Patrick, acting for Arthur Winslow and J. D. Hubbard, trustees respectively for the United States & British Columbia Mining Co., and a syndicate of Chicago gentlemen. The amount of the bond was \$75,000, of which \$5,000 was a cash payment, and the balance spread over a period of twelve months. During the life of the bond, the purchasers had the privilege of working the property on a royalty of 25% of the net proceeds, with the understanding that the amounts paid in royalties were to apply on the purchase price of the property. As a matter of fact, the first cash payment of \$5,000 was the only money actually required to finance the property, the balance of the payments being met from royalties, as they became due.

Work was commenced by Winslow and Hubbard in the latter part of October, 1903, at which time the workings consisted mainly of a shallow open-cut and drift or 'tunnel' about 90 ft. long, which exposed 30 ft. of shattered and oxidized quartz and kaolinized material. This was divided into two portions, namely, about 20 ft. in the open-cut, which, according to samples, averaged \$20 per ton, and about 10 ft. near the surface of the drift, which averaged \$150 per ton. The value was almost entirely in gold, which was bright and yellow, so that it made a good showing in the gold pan or horn. In addition to this cut and drift there were several other shallow cuts and pits, two of which exhibited a similar material, which sampled from \$5 to \$10 per ton, while others were location holes in soft decomposed and iron-stained rock.

At this time the town of Goldfield consisted of a few tents, two of which were stores, one was a so-called restaurant providing very inferior food, and three saloons. All were the result of the excitement occasioned by the bonding of the Combination and Jumbo groups of claims, and the spreading of reports of the richness of the ore.

Outside of the individual prospecting which was being prosecuted at this time, the only work in progress was on these two properties, both destined to become important mines.

At the Combination, five or six men were put to work sinking a small shaft on the high-grade ore discovered in the drift, and sacking the ore broken in this manner. At the Jumbo claim on the opposite hill, John Harvey, acting for Patsy Clark of Spokane, took a bond on the property immediately after Patrick bonded the Combination, and commenced a small shaft on the hanging wall of the lode. After reaching a depth of 50 ft., he cross-cut the lode and drove a few feet in both directions. Finding the results of his sampling poor, Harvey stopped work, relinquished his bond, and by so doing just missed by a few feet one of the bonanza ore-shoots of the Goldfield district. Shipments of ore from the Combination commenced during November, 1903, and continued without interruption until the commencement of milling operations in May, 1905. The average gross value of the ore shipped during this period was \$104 per ton, and it is an interesting fact that the first car of ore shipped from the mine, which averaged \$160 per ton, was the lowest in grade that was ever shipped. At first the ore was hauled by teams to Candelaria, a distance of 65 miles by wagon-road, at a cost of \$12.50 per ton; but with the advent of the railroad into Tonopah, the long haul was discontinued, and all ore was taken to Tonopah, and there loaded on the cars for shipment to the Selby smelter at Vallejo Junction, California. By shipping from Tonopah on the



Main Shaft and Glory Hole.

railroad, a considerable saving in time was made, but owing to the high freight-rates charged, the saving in cost of transport was practically nothing. After it was demonstrated that a satisfactory extraction could be obtained in the mill, all shipments of ore were discontinued, with the exception of a small amount of high-

grade sulphide ore, which was, naturally, the most refractory in the mine. Excess freight-rates were charged by the railroad company on all ore assaying above \$300 per ton. This excess rate amounted to 3% of all such excess. Thus on ore assaying \$400 per ton, the excess freight rate was \$3 per ton in addition to the regular freight charges. In consequence, the richest ore was sacked and stored pending the starting of the mill. This ore, amounting to 129 tons, was then run through a five-stamp battery, and over amalgamated plates, and the tailing then run to an empty leaching-vat, in which they were partially drained. After draining sufficiently, they were sacked and sent to the smelter. The original ore assayed 48 oz. gold per ton, and the sacked tailing assayed 18.3 oz. gold per ton. The recovery by amalgamation was therefore approximately 62%. The battery was run on day-shift only, the mill being locked and guarded at night.

This district is now so widely known, and so much has been written of its geology that it is unnecessary for me to go into the question further than to remark, briefly, that the lodes are shattered and fissured zones of silicification formed by hot solutions, under pressure from below, which, following the lines of least resistance, deposited their silica and the accompanying minerals in the zone of fracturing. It is probable that there were other subsequent flows of mineralizing solutions that to some extent concentrated the precious metals in the more fissured portions. In the main workings of the Combination mine, both country rock and lode consist of altered dacite; this is also the case in the Jumbo, Mohawk, and January mines, but in the main workings of the Florence mine, which is situated about 1,500 ft. distant on the southeast continuation of the same silicified zone or vein, the country rock in close proximity to the vein is an altered andesite.

These silicified zones may be regarded as veins, and ore may be looked for either on the foot or hanging-wall side, or even throughout the whole of the silicified mass. As a rule, however, the ore-shoots follow lines of shattering somewhat diagonal to the general course of the silicified zone itself. In the Combination, the general course of the silicified zone is northwest-southeast, while the average course of the richer streaks is nearly north-south. These north-south seams do not extend into the country rock for more than a few feet beyond the limits of the silicification. Where the lode has been rather more shattered than usual and has therefore offered a better channel for the mineralizing solutions, the ore-shoot may include the whole of the silicified material. This occurs in several places in the mine, for instance, immediately adjoining the point of discovery in the shallow 'tunnel,' the ore-shoot is from 30 to 50 ft. wide and about 120 ft. long. Again, on the second level in the split known as the East vein, the silicified zone for a width of over 20 ft. and a length of 150 ft., is one large ore-shoot. Continuing in a southeasterly direction the ore-shoot narrows to a width of four feet of pay-ore and follows the hanging wall of the lode, so that the soft bluish porphyry forms its hanging wall also.

The ore is, as already mentioned, a mixture of soft kaolinized material, with hard dacite in all stages of silicification, from rock showing the original porphyritic structure to dense flinty quartz. The best ore is found in the small stringers and veinlets, already mentioned, that traverse the main body of the lode. In the oxidized portions of the mine—above the 130-ft. level—these are largely filled with small fragments of quartz mixed with a characteristic yellow or reddish ochery material, which is mainly kaolin formed by the decomposition of the feldspar in the original rock. When the sulphide zone is

reached, the rich stringers in the lode are easily followed, as the shattered clayey material is heavily impregnated with sulphides, forming a well-marked dark seam. The richest ore in the mine is usually found on the 'faces' forming the sides of these points, where the gold-bearing solutions have had the best opportunity to precipitate.

The following minerals have been observed in the Combination mine, the names being quoted in the order of their importance. In the oxidized zone: Quartz, kaolin, iron pyrite, gypsum, hydrous ferric oxide, alum, some silvery scales of a mineral that gave blow-pipe reactions for bismuth oxide, and small quantities of a tellurite of iron. Near the water-level: Ferrous sulphate. In the sulphide zone: Kaolin, iron pyrite, marcasite, tetrahedrite, bornite, bismuthinite, and very small quantities of chalcopyrite and zinc-blende. Of these minerals, the tetrahedrite and the bornite are particularly important as being intimately associated with the gold. Free gold is often seen mixed with the cuprififerous sulphides, but even when this is not the case, and no gold can be seen under a powerful glass, the specimen will, almost invariably, assay exceedingly rich in gold; from which it is presumed that the gold is either chemically combined with the bornite and tetrahedrite, or else present in a very fine state of division. The appearance of the bismuthinite is no indication of either good or indifferent ore, as specimens have been found showing both free gold and tetrahedrite, and again other specimens, showing bismuthinite and pyrite alone, assay but a few dollars per ton. Similarly in the oxidized zone, no particular change in the value of the ore is noticed when the silvery specks of bismuth oxide appear. The ferrous sulphate is partly mixed with alum and was found on the 130-ft. level as plates with a bluish green color filling the joints of the soft rock forming the hanging wall of the lode. Great care was taken to preserve some of these specimens, but although placed in a tight tin vessel almost immediately, they gradually lost their color, and became dehydrated.

A section of the Combination lode shows the following peculiarities distinctly:

1. Silicification is greatest on surface and is less marked as each succeeding level is reached.
2. Gradual flattening of the vein on its dip, which reaches an angle of 30 to 35° northwest.

The first of these might well be expected in the case of deposits formed by thermal waters followed by only partial erosion. The second, however, is far more of a problem, and it is one that has yet to be studied and satisfactorily explained. The flattening of the vein commenced in the shaft just about the level at which water was first struck—210 ft. At this depth a strong seam came in from the foot-wall side of the shaft, and the ore turned with the wall. Some very rich ore was encountered in the shaft where the splice was made. The greater part of this consisted of partially rounded small boulders of flinty quartz, on the outside of which were concentric layers of the following minerals, in the order enumerated, beginning from the outside: A layer of either marcasite or iron pyrite in botryoidal form; next a layer of quartz with specks of a grayish black mineral, which was later determined as a form of tetrahedrite; and inside this a layer of rusty gold about $\frac{1}{8}$ in. thick. In all the specimens found this order of deposition was observed, and in other places in the mine at which faces of similar specimen ore were found the order was identical. It would therefore seem reasonably certain that the free gold was one of the first minerals deposited.

Very rich ore was found in this mine clear from 'grass roots' down to the bottom or 280-ft. level. Taking it

altogether, however, the richest ore was found between the 180 and 230-ft. levels. Here the vein dipped at an angle of about 45° and consisted of a narrow 'gouge' or selvage of kaolinized material with rounded fragments of quartz heavily impregnated with sulphides. Immediately below this came several inches of the silicified dacite containing stringers and faces of free gold and rich cupriferous sulphide. In many places the rich ore consisted of a rich 'face' only—the rest of the material being low-grade. Underneath this rich seam, the value of the ore dropped immediately to low-grade ore, and sometimes to waste, there being no definite line between them.

As might be expected with such high-grade ore, stealing, or 'high-grading,' as it is generally called, flourishes to an extent unknown in the older mining districts. This is especially true in the case of the bonanza leases, which are worked under high pressure, and where anything in the shape of a delay means the loss of a considerable amount of money. The loss to the mine-owners from 'high-grading' has been estimated at several hundred thousand dollars. This is probably in excess of the true amount, but it must certainly have been very large. Many of the miners that have become expert in the business while working in the mines of Cripple Creek, obtained work in the Goldfield mines, solely for the purpose of stealing ore. These men used to wear a regular harness, to enable them to carry off 40 to 70 lb. of ore on each shift.

In the oxidized portions of the Combination mine, where the richest ore cannot be distinguished by its appearance, panning with drilling water serves to guide the 'high-grader,' and men have been known to 'horn' from 20 to 30 times in a shift. Needless to say, a great deal depends upon the honesty and fearlessness of the mine foreman.

Following the 'high-grader' came many so-called assayers, who ran assay-offices as 'blinds.' Until comparatively recently, it was impossible to do anything to stop ore-stealing. The Miner's Union would not allow change-rooms, and it was impossible to secure the conviction of a man for theft. Since the strike of last December, however, change-rooms have been built at all of the principal mines and several convictions have been secured. This will undoubtedly tend to restrict the wholesale theft of ore.

MINING IN COSTA RICA.—According to a report the following mines have been milling ore during 1906: The Abangarez Goldfields of Costa Rica; the Esperanza Mining Co. (late Boston mine) in the Abangarez district; and the Colburn Mining Co. at Pozo Azul, near Chomes. Development work is proceeding at the Montezuma mine, in the Barranca district, and the Machuca mine, in the Aguacate district. The value of the gold and silver exported was £110,645. The average rate of wages paid to day laborers in the interior has gone up, and now stands at 2s. 4.56d., and in the Limon province, on banana farms and railway work, at 4s. 1.80d. The wages of artisans of all classes have also gone up 20%. This does not, however, indicate any general advance in prosperity among the working classes, since the cost of living has also increased.

TOURMALINE IN CALIFORNIA.—The colored tourmalines of the Pala district, in San Diego county, are well known. The principal varieties are rich, deep-red rubellite, from the Pala Chief mine, and various colored tourmalines, though mainly pink rubellite, from the San Diego Co.'s property, at Mesa Grande.

Decisions Relating to Mining.

Specially Reported for the MINING AND SCIENTIFIC PRESS.

In case of unavoidable shortage of cars, a railroad company may distribute such cars as it has to the several mines on its line of road on a percentage basis, calculated on the production of the several mines. The mine owners are only entitled to their proper percentage of available cars; but such distribution cannot interfere with the right of individual owners to the exclusive use of their own cars. And the railroad company may allot an arbitrary number of cars for development to new mines which have no basis for a percentage.

United States v. Baltimore & C. R. Co., 154 Fed. 108. (June, '07.)

A trustee operating a mine under a lease for a term of 50 years, with the right to terminate the lease and remove the machinery if the enterprise should prove unprofitable, was held not liable to a beneficiary for surrendering the lease after prosecuting the enterprise for more than 10 years unsuccessfully.

Mexican Nat. Coal & C. Co. v. Frank, 154 Fed. 217. (April, '07.)

Where stockholders of a mining corporation applied to a court of equity for protection of their rights against the alleged wrongful acts of the directors, they could not recover for failing to act with reasonable diligence, or present some excuse for not having done so.

Jones v. Bonanza Min. & C. Co., (Utah) 91 Pac. 273. (July, '07.)

In an action for the possession of an unpatented mining claim, under a complaint alleging ownership, possession, and right of possession at a specified date and the ouster by defendant of plaintiff, the defendant may show, under a general denial, that the deed under which the plaintiff claimed title was invalid.

Holmes v. Salamanca Gold Min. & C. Co., (Cal.) 91 Pac. 160. (June, '07.)

Where a miner was injured by a fall of rock from the roof of a mine in which he was working, it is proper to show, in an action for damages, that the mine was inherently dangerous, and that skillful operators should have known of such condition and taken precaution against it. But it must appear that the conditions at the time of the accident were the same as those at the time to which the testimony related.

Arts v. Standard Plaster Co., 105 N. Y. Sup. 440. (July, '07.)

A mining corporation may issue stock to an attorney in payment for services rendered, and in the absence of fraud, it cannot be questioned by a stockholder.

Bogeler v. Punch, (Mo.) 103 S. W. 1001. (June, '07.)

A mining company has the right to use a stream of water for mining purposes, but it cannot pollute such stream to the injury of a lower land-owner.

Alabama & C. Coal Co. v. Vines (Ala.) 44 So. 377. (June, '07.)

A lease of land for the sole purpose of operating for oil, is not binding on the lessee; and on failure of the lessor to operate for oil, or pay the sum agreed upon in advance, he forfeits all rights under the lease.

Jennings-Haywood Syndicate v. Houssiere-Latreille Co., (La.) 44 So. 481. (June, '07.)

The owner of the legal title to coal underlying a tract of land owned by another is not required to exercise particular acts of ownership over the coal in order to retain title thereto, and, to be divested of his title by adverse possession, the possession must have been continuous and adverse for the statutory period.

Gordon v. Park, (Mo.) 100 S. W. 621. (March, '07.)

The Laist & Tanner Movable Converter Hood.

Written for the MINING AND SCIENTIFIC PRESS
By L. S. AUSTIN.

This hood (patent applied for) is the invention of Mr. Alex. Laist, superintendent of the Highland Boy smelter, near Salt Lake City, Utah, and of Mr. W. N. Tanner, constructing engineer, of Salt Lake City. It is a modification of the Arizona hood and has been carefully designed for effective service.

Fig. 1 is an elevation of the converter, the hood, and its connections. The hood is represented in position to receive the escaping gases of the converter during the blow. Fig. 2 shows at the right-hand edge one of the old hoods, and the ineffective removal of the stifling sulphurous acid gases, while Fig. 3 shows how thoroughly, with the improved hood, these fumes are taken away. Under the old way of working it was difficult to keep men, and the crane-men worked but six hours at a time. As now arranged the converter-house, which is open to the sky, is a pleasant place to work, and the work is more effectively performed. As indicated in Fig. 1, the hood in working position is thrust through a curtain or screen which covers the space just back of the con-

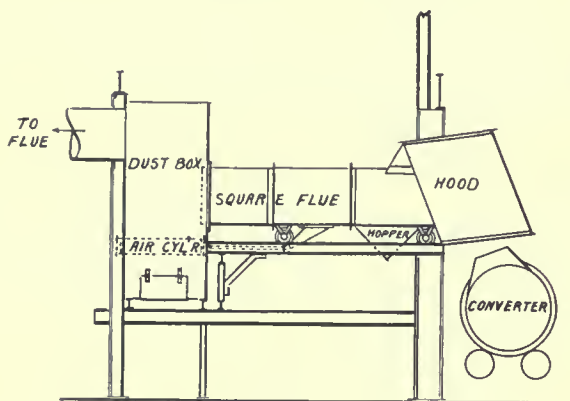


Fig. 1. Movable Converter Hood.

verter (this screen has not been put in in Fig. 3), and thus the blowing about of the smoke by chance air currents is avoided. The hood and square flue (Fig. 1) are in one, and can be slid back when a converter is to be removed from its stand. The joint between the flue and the dust-box is made with flexible asbestos board, held in place by a strap of iron attached to a dust-box, and making a reasonably close joint. When in the backward position, the end of the flue closes off the draft, so that the draft for the other converters is maintained. The flue is mounted on wheels and is moved by means of an air-cylinder operated by the compressed air from the blowing engine at 12 to 16 lb. per square inch.

The air-cylinder is of 12 in. diam., and its piston-rod is directly tied to the bottom of the movable flue. The hood is lined with cast-iron plates, bolted to the interior of the casing, as is well shown in Fig. 3. The dust-box has an outlet to the main common flue of the system, and has an A-shaped bottom with cleaning-doors for the removal of flue-dust. The air-cylinder is beneath this box at the apex of the A. A large part of the flue-dust is caught in a hopper immediately beyond the hood, and is removed as it accumulates. The hood may be moved forward as rapidly as desired, but it is best, in order to avoid shocks, to take about half a minute in so doing.

The writer has particularly observed the performance of this hood, as compared with other designs, and has noted that it is far more effective in that it adds so greatly to comfort in operation. This matter of the

health and comfort of the men is often to too great an extent neglected, and yet an enlightened self-interest shows that it pays out of proportion to its cost.

CHROME iron is found in large quantities in the ser-



Fig. 2. Old Type of Converter Hood.

pentine belt in the Eastern Townships, Quebec, between Disraeli and Broughton, in the hills to the southeast of



Fig. 3. Improved Hood.

the Quebec Central railway, but it is worked commercially only in the Black Lake district. Until recent years no serious operations had been undertaken for its production, but it has been clearly shown that it should take a high rank among the mineral resources of the province.

Genesis of the Ores of Leadville.

By S. F. EMMONS.

*The explanations given in the original reports on the Leadville district of the origin and formation of the ores in limestone have been in many respects very generally misconstrued in subsequent publications. In some of these the writer is assumed to have stated that the ores were brought in by waters descending directly from the surface; in others, that the metallic contents of these waters were derived from the overlying White porphyry, neither of which views he actually held. It would seem that the authors of these publications must have formed their opinion from reading only the preliminary statement, published immediately after the close of field work in 1882, rather than from the more complete explanation given later in the Leadville monograph. In the former¹ it was briefly stated with regard to the origin of the deposits:

1. That they have been derived from aqueous solutions.
2. That these solutions came from above.
3. That they derived their metallic contents from the neighboring eruptive rocks.

In the final report² this statement was made more explicit, as follows:

With regard to the *immediate* source from which the minerals forming these deposits were derived, the following conclusions have been arrived at:

1. That they came from above.
2. That they were derived, mainly, from the neighboring eruptive rocks.

By these statements it is not intended to deny the possibility that the material may originally have come from great depths, nor to maintain that they were necessarily derived entirely from eruptive rocks at present immediately in contact with the deposits.

The facts and reasons on which these conclusions are based will be given in the following chapters.

At the time the preliminary report was in preparation, capitalists were being urged by J. Alden Smith, State Geologist, to sink deep shafts immediately down to the Archean, on the theory that, since ore-bearing solutions came from below, the Leadville ores must necessarily have ascended through fissures in the underlying granitic rocks, and the orebodies found there, being nearer to the source, would be more valuable than those found in the limestone, his belief being that "these fissures and deposits will be extensively and profitably worked for centuries after the contact deposits now operated are exhausted."³

In the light of the geological investigations he had made, this seemed to the writer a mistaken idea, which, if followed, would result in pecuniary loss and might retard the development of the district; hence he made his statement strong, and, as results have since proved, rather too unqualified.

Geological studies of ore deposits up to that time had been, mainly, of veins that follow nearly vertical fissures in the rocks, of which the most natural explanation is that they are formed by ascending solutions; and in ordinary mine reports, for which, as a rule, but little study of the general geology of the district was deemed necessary, the rather perfunctory statement was generally made that the vein materials "came from below," without any very definite understanding on the part of the writer of what these words implied.

It was, moreover, generally assumed, that all waters

circulating within the crust of the earth came originally from the surface, descending under the influence of gravity and ascending again under the influence of heat—either the normal increment of heat within the crust, or that due to proximity with some cooling igneous mass. The modern idea that cooling igneous masses have given off enough occluded water to furnish a continuous underground circulation was then, and for many years afterwards, not considered tenable.

In undertaking the study of the Leadville mines, the writer proposed to take a new departure in making, as a preliminary, a thorough study of the geological structure, not only of the immediate vicinity of the mines but of the whole mountain region within a radius of about 10 miles around, and to base his attempt to explain the manner of formation of the ore deposits on the geological data thus obtained, quite independently of whether the resulting explanation accorded with current theories or not. As it was his first study of any important group of ore deposits, he did not feel competent to go into abstract questions about their origin, much less to present a general theory of ore deposits, as some seem to have assumed he did; hence, in speculating as to the source of the metals, he thought it wiser, as the important object was to furnish a guide to the miner in his search for orebodies (as stated explicitly in the text, Monograph 12, p. 572), "to leave out of consideration altogether the ultimate and purely speculative source and to confine the investigation to the more immediate source, about which it was possible to obtain some actual and demonstrable evidence." Then, after stating that the commonly received explanation for vein deposits is that they have been formed by directly ascending heated solutions, he said: "In the case of the Leadville deposits, the inadequacy and even falsity of this explanation, *except as applied to the ultimate source from which the metals may have been derived*, is readily apparent." He then proceeded to give the reasons for this statement by showing that the form of the orebodies was such as to lead to the conclusion that the ore-bearing bodies entered the limestone from its contact with the porphyry sheets. These contacts being the main channels of circulation and mainly at the upper surface of the limestones, "the few approximately vertical bodies [of ore] that have come under observation afford no evidence that their walls form part of a channel through which the ore currents came up from below;" hence, he concluded, "the above considerations seem sufficiently conclusive evidence against adopting upward currents as the direct source of the ore deposits of Leadville."

In further argument against the necessity of resorting to the unknown depths to find the source of the metals, the author proceeded to give the result of chemical tests of the country rocks, especially those of igneous origin, which showed that small amounts of vein material were found in most of the latter and that most of the varieties of porphyry, except the White porphyry, contained appreciable amounts of silver. Then, without attempting to decide which particular variety of porphyry the metals came from (which he explicitly stated was "too difficult because of the amount that had been removed by erosion since ore deposition") he said: "The foregoing reasons seem to favor the probability that the ores may have been derived, in part at least, from one or more of the bodies of porphyry which occur in the region."

While the intimate genetic connection between the ores and porphyry was established, as he conceived, with reasonable certainty, he admitted that there was still some doubt about the ultimate source of the metals, remarking:

It is possible that in future years, when mine work-

*Abstracted from Bulletin No. 320, United States Geological Survey. "The Downtown District of Leadville, Colorado." By Samuel Franklin Emons and John Duer Irving.

¹Second Ann. Rept. U. S. Geol. Survey, 1882, p. 231.

²Mon. U. S. Geol. Survey, Vol. XII, 1896, p. 379.

³Report on mineral and other resources of Colorado for 1881 and 1882, p. 61.

ings shall have been extended over areas where the ore horizon exists at considerable depths below the surface and other eruptive channels have been found and critically examined, evidence may be obtained that ore solutions have ascended along these channels from below.

The idea that was in his mind in saying this was that inasmuch as the Gray porphyry within the mineral area is a distinctly later eruptive than the White porphyry, if the channels were found through which this porphyry had reached the Blue limestone horizon these might prove to be also the channels through which the ore-bearing solutions had reached that horizon.

In the time that has elapsed since the Leadville report was written some of the conclusions have been severely criticized by prominent geologists, notably the genetic connection of ore deposition with igneous eruption and the metasomatic replacement of limestone by ore, but practically all of these conclusions may now be regarded as universally admitted by economic geologists, with the exception of the determination of the source of the metals. With regard to this, it may be said that in treatises on ore deposits written within that time the general opinion seems to be that the writer wrongly conceived the ores to have been brought in by descending waters, but that mining engineers who had become more familiar with the deposits by later and more continuous underground observation had proved them to have been brought up from below by hot ascending solutions.

Having already endeavored to show in what respect the author's statements were misconstrued, it may be well to see how far these statements are justified by a careful consideration of the articles on which they were based.

The mining engineers to whose writings references had been made were Messrs. F. T. Freeland⁵, Charles M. Rolker⁶, and A. A. Blow⁷. Of these Mr. Freeland did not discuss at all the source or origin of metals. Mr. Rolker, confining himself to the direct source, objected chiefly to the assumed statement of the writer that the ore-bearing solutions descended directly and exclusively from the overlying White porphyry, inasmuch as his own observations show that on Fryer Hill, where he had had been in charge of an important mine, the orebodies do not occur exclusively or predominatingly on the upper contact of limestone with porphyry, and that they appeared to have a closer genetic connection with the Gray than with the White porphyry. His general statement with regard to the deposits of the district, however, is as follows:⁸

They are found mainly as contact deposits between the Carboniferous limestone and the overlying felsite, with additional or incidental ore accumulations in the limestone in irregular cavities, directly or indirectly connected with the plane of contact by irregular and often minute conduits, which a careful search reveals.

This statement, as far as it goes, is a confirmation of that of the writer.

In a subsequent article in the same periodical⁹ the writer has pointed how far the apparent discrepancy of their views arose from a misconception, on the part of Mr. Rolker, either of his statements or of the facts.

Mr. Blow's article, based as it was on nine years' continuous observation of the practical extraction of ore in a part of the region where the orebodies have been deposited to a considerable extent along vertical fractures as well as on the more or less horizontal contacts and bedding planes in the limestone, constituted an invaluable contribution to the geological history of Leadville ore de-

posits, and his conclusions from actually observed facts, such as the origin of manganese in the oxidized ores, and of secondary enrichment, especially of zinc in the upper part of the sulphide bodies, showed remarkable acumen in observation and reasoning. The more theoretical part of his article, relating to what the writer would have called the ultimate source of the metals, is, however, less satisfactory, because, while professedly intended as a refutation of the writer's views, it starts with a misconception of those views, and also because it brings no observed facts to support those which he proposes as a substitute for them.

The misconception consists, first, in his failing to appreciate the fact that the writer was speaking only of the immediate source and declined to discuss the ultimate and theoretical source, and, second, in his mistaken assumption that the writer stated that the metals were derived from the White porphyry. The main part of his argument is devoted to the refutation of this latter mistaken assumption, and is purely negative; but, when he comes to his positive assertions, he simply gives as the alternative source the word 'below,' the use of which the writer had deprecated because of its indefiniteness; and as to the manner in which the solutions reached the present locus of the orebodies, or what the writer would have called the immediate source, he says:¹⁰

That such ascending solutions more readily penetrated the limestone along the planes of contact of the igneous and sedimentary formations, and through zones of least resistance in the latter previously marked out by the intrusion of the porphyries, and gradually replaced the limestone with the metalliferous contents in the form of sulphides.

The writer, in seeking for reasons for the location of the majority of the orebodies in the Blue limestone, states:¹¹

The great intrusive sheets of porphyry are found to follow it most persistently, mainly along the upper surface, less frequently along its under surface, and also cutting transversely across it. These intrusive bodies are also found at other horizons, it is true, but at none so persistently and so uniformly as at this. Thus both ascending and descending currents would readily reach these beds, the latter trickling through the uniformly permeable eruptive rock, the former following up the walls of the channels, through which it was erupted.

Thus, taking into consideration the greater development of orebodies and intrusive sheets of Gray porphyry which had been shown to exist at the time Mr. Blow wrote, the difference in view between him and the writer is not essential, for he does not bring any facts to bear against the latter's third reason for declining to accept upward currents as the direct source of the ore, that is, "the noticeable absence, in the region of greatest ore development, of channels extending downward, through which the ascending solutions might have come." Indeed, in his descriptions he speaks of the ores as going downward rather than upward, and when they occur along vertical fractures he does not suggest their continuation below the Blue limestone, but simply argues against their immediate derivation from the overlying White porphyry, and is apparently no more a believer in Mr. J. Alden Smith's theory than was the writer. Yet the region he treats of is the one region in Leadville where vertical cracks are most frequently found in connection with ores in limestone, and it is upon their occurrence that Mr. Blow founded his theory of northeast shoots as the prevailing form of Leadville orebodies. Hence, the assumption of the various treatises on ore deposits that the writer's theory as to the source of the metals has been disproved by Mr. Blow seems to

⁵Sulphide deposits of South Iron Hill: Trans. Am. Inst. Min. Eng., 1885, Vol. XIV, 1866, pp. 181-189.

⁶The Leadville ore deposits: Ibid, 1885, Vol. XIV, 1866, pp. 273-292.

⁷The geology and ore deposits of Iron Hill: Ibid, 1889, Vol. XVIII, 1890, pp. 145-181.

⁸Loc. cit., p. 282.

⁹Genesis of certain ore deposits: Trans. Am. Inst. Min. Eng., 1866, Vol. XV, p. 125.

¹⁰Trans. Am. Inst. Min. Eng., Vol. XVIII, 1890, p. 174.

¹¹Mon. U. S. Geol. Survey, Vol. XII, 1888, p. 541.

have been founded on an unfortunate misconception of the facts.

On the other hand, with regard to the ultimate source of the metals, it does not appear from his text that Mr. Blow is entirely clear in his mind as to what that source was, or as to the process by which the vein minerals were derived from it. In one place he says¹² that "it does not necessarily preclude the theory that the porphyries were the derivative rock mass from which the ascending solutions receive their metallic contents, * * * to be ejected subsequent to the porphyries, and consequent upon their intrusion;" and later that the "solutions were forced up with their mineral contents from the deep, from the same regions and in the same manner as that of the intrusive dike porphyries with which they are here and elsewhere so intimately connected." Mr. Blow frankly agrees with the writer, however, in admitting that the theory that the solutions came from below is not susceptible of direct proof; hence, the real difference between him and the writer is that the one was willing and the other was unwilling to put forward views in support of which he could bring no facts of observation.

In more recent times, as the knowledge of ore deposits, through scientific studies, has increased, and the more theoretical questions with regard to them have become frequent subjects of discussion, many important changes have been brought about in the views generally held with regard to the origin and manner of formation of ore deposits. It has been actually demonstrated:

1. That deposits in limestone have been formed by directly ascending solutions, of which those of Rico, Colorado, are the most notable instances.

2. That certain deposits in limestone have been formed primarily by direct emanations of mineral-bearing solutions from intruded igneous masses during cooling and consolidation, to which alone the term contact deposits is now considered to be scientifically applicable, since they are characterized by the presence of minerals formed during what is known as contact metamorphism. Up to 1901 there were no published scientific descriptions of such deposits in the United States, but since that time a vast number of important deposits, especially of copper, have been described as properly belonging to this type.

3. That certain deposits, especially of magnetic iron, have been actually formed by magmatic segregation from igneous masses during their cooling and consolidation.

4. That underground waters, which are still regarded as the most important vehicle for the transportation of vein material within the earth's crust, are not necessarily all of meteoric origin, as was formerly thought, but may rise from the squeezing out of occluded water from igneous magmas as they cool and contract. That such magmas are giving out water in sufficient quantity to feed thermal springs or to form ore deposits is of course not susceptible of direct proof. It has long been recognized that during volcanic eruptions great quantities of the vapor of water escaped into the atmosphere, but this phenomenon has hitherto been explained as the result of the descent through fissures of ocean waters that came into contact with the rising magmas and thus produced extensive eruptions. Suess, the most prominent advocate of the modern theory, claims that it is not the ocean that feeds volcanoes, but that volcanoes have furnished water to the ocean. Indirect arguments in favor of this theory are found first in the observed fact that in very deep mines the lowest levels are relatively or absolutely dry; whence it is assumed that if surface waters do not reach such comparatively shallow depths they can hardly be

supposed to have been the vehicle which brought the metals up from the barysphere, which must be fifty or a hundred fold as deep, or even to have reached any very deep-seated cooling magma. Second, European geologists, who have been making very long and thorough chemical studies of thermal waters, claim to be able to distinguish among them, by the relative permanence of their chemical composition and degree of saturation, those which are fed exclusively by cooling magmas, or what Suess calls 'juvenile' waters, from those which are fed exclusively from meteoric waters, or 'vadose' springs, or, again, those which are fed in part from one and in part from the other source.

5. Finally, it is generally admitted that the ores as now found in an ore deposit may be the result of a solution and re-precipitation many times repeated, each process resulting in a concentration of its metallic contents. Most important of these, from an economic view, is the secondary enrichment by surface waters. This was noted by the writer in his original report, as applied to the oxidized ores, but it was not then supposed to be possible chemically that it might go on below the ground-water level in the sulphide zone. This has recently been demonstrated, however, by actual laboratory experiments, and the action is recognized as the most important factor in forming the bonanzas of exceptionally rich deposits.

It may be assumed that economic geologists now generally agree, without much qualification, that the limestone ores in the Leadville district were originally deposited

1. From aqueous solutions.
2. In the original form of sulphides.
3. By metasomatic replacement of the country rock.

AGE.—These ores were deposited after the porphyry sheets were intruded and consolidated, but before the dynamic movements which produced the great structural faults of the region. Geological investigations made since the original report was prepared have led to the conclusion that the great preliminary fault-movement may have taken place at the close of the Jurassic period, or previous to the beginning of Cretaceous sedimentation, and inasmuch as it must logically be assumed that the structural faulting in the Leadville district was contemporaneous with that of the Mosquito fault the ores in limestone may have been originally deposited in pre-Cretaceous time.

It is further recognized that a small amount of deformation of the sedimentary beds must have taken place at the time of the intrusion of the porphyry sheets, which produced some slight folding and fracturing of these beds, and thus commenced the localization of the orebodies.

That there has been movement in comparatively recent times along the great structural faults, as was originally stated, has now been definitely proved. Underground exploration has shown that the comparatively recent rhyolitic tufts and agglomerates are much more widespread in the district than was indicated on the original map. They have cut through and split important orebodies, but have apparently been confined to the region around Breece Hill, and have not affected the limestone deposits in the lower part of the district.

DISTRIBUTION OF ORE.—It was originally assumed, on evidence then available, that the Blue limestone was exceptionally favorable to the deposition and concentration of ore, but it was also stated¹³ "that valuable deposits are occasionally found elsewhere, generally along bedding planes or contact surfaces, and less frequently on jointing planes."

Mining developments since that time have shown that

¹²Trans. Am. Inst. Min. Eng., Vol. XVIII, 1890, p. 181.

¹³Second Ann. Rept. U. S. Geol. Survey, 1882, p. 237.

the predominance of orebodies along the upper contact of the Blue limestones is by no means so great as was originally supposed, some of the most important ore-shoots having been found within its mass at points away from that contact, generally under the sheet of Gray porphyry, but also within the mass of the White limestone. These are locally called second and third-contact bodies, respectively. Orebodies also occur within the Parting quartzite and in the upper part of the Cambrian quartzite. No important and rich ore deposits have been found, however, within the purely siliceous beds at the lower part of the Cambrian, nor at the contact of the latter with the crystalline complex or Archean, such as J. Alden Smith thought would "be extensively and profitably worked for centuries after the contact deposits now operated would be exhausted."

It should be further remarked that the important deposits of gold ores in and adjoining fissure veins in the Breece Hill region are not included in the present discussion, which is confined to the limestone ores treated of in the original report, since their genesis is considered to be distinct and more or less independent of the latter, and will be discussed at length in the general report.

As regards the areal distribution of the principal orebodies, it bears an evident connection with that of the later intrusive or Gray porphyry sheets, the details of which cannot be finally worked out until the general geological map of the district is finished. It would appear at present, however, that where these intrusive bodies have distinctly broken up from below, across the sedimentary beds, as have those that form the mass of Breece and Dome hills, the ores in limestone tend to form around the periphery of such masses.

IMMEDIATE SOURCE OF THE METALS.—In considering the source or origin of the metallic contents of the ore it seems well to preserve the distinction originally made by the writer between the *immediate* and *ultimate* sources, although this distinction has been ignored by subsequent writers. General treatises can not go into the minute details of structure involved in a consideration of the immediate source, but must be confined to the broader features in their bearing on general theories. Moreover, few, if any, of their authors have ever visited this district, much less made detailed studies of the geological relations of its deposits. On the other hand, the mining engineers, whose opportunities of studying the details of the orebodies that come under their observation were unquestionably much superior to those of the writer, not being professional geologists and having worked in a relatively limited field, may not have noted the bearing on general theories of all the geological facts that came under their observation.

The determination of the immediate source of the ores is important, even though it may not necessarily affect that of the ultimate source, inasmuch as it furnishes data of practical use to the miner in his search for ore. Thus, in the present case, it would appear that the conception of the authors of general treatises who maintain that the ores were brought in by hot ascending solutions from some deep-seated source is that in their upward course these solutions were stopped by a relatively impermeable barrier, in this case the overlying porphyry sheets, and hence spread out laterally, depositing their contents in the limestone underlying these porphyries. In such a case one would expect to find cracks or fissures extending more or less vertically downward from the respective orebodies which might have constituted the channels through which the solutions ascended directly to the porphyry contact.

On the other hand, if the ore-bearing solutions, in the latter part of their circulation or immediately before

they deposited their contents in the form of the present orebodies, were moving along the contact planes between porphyry and limestone, they could react on the soluble limestone from these contacts outward and form orebodies, either along the immediate contact or at points within its mass, reached through cacks and joints. On this hypothesis, if most of the contact orebodies were found under the porphyry sheet, the prevailing course of the ore solutions would have been downward, and such solutions might have formed orebodies on the upper contact of a lower sheet, because that sheet presented a barrier to their downward course.

As regards the ultimate source of the ores, while the former of these hypotheses is more peculiarly applicable to the deep-seated source, the latter is not inconsistent with the derivation of the metals from either the barysphere or from igneous masses within limited distances of the ore deposits.

Leaving entirely out of consideration, for the moment, the question of the ultimate source of the metals, the evidence as to their immediate source must first be considered, since, from the writer's point of view, that is the only one really involved in the criticisms of his original report. In favor of the first, or what might be called the 'fissure hypothesis,' is the discovery in recent years of deposits coming from or directly connected with vertical fissures in the Breece Hill region, which, however, according to the writer's view, were formed in a distinct and different manner from the deposits in limestone in the lower part of the district, which are now under consideration. In the latter deposits the writer has been unable to find evidence which seems to him conclusive in favor of the fissure hypothesis, or which might not be as readily interpreted in favor of contact and stratification planes as channels for the ore-bearing solutions. Cracks and broken or fissured zones are, it is true, found in connection with some of the limestone orebodies, especially with orebodies that have a decided linear arrangement, such as the ore-shoots on South Iron hill, described by Blow. In a broad, general way, these shoots lie in two prominent or major directions—a northwest-southeast direction, which prevails on Iron and Breece hills, and an east-west direction, which is more prominent in the northwest portion of the district. These apparently correspond to those of the axes of slight folding and fracturing that took place about the time of the intrusion of the porphyry. The structural conditions accompanying these fissures do not resemble, however, those connected with the limestone deposits of Rico, Colorado, which may be taken as the type of those formed by solutions that ascended through fissures. At Rico the feeding fissures contain well-defined and crustified vein deposits. They end upward at a bed of impervious shale that overlies the limestone, but no limit in depth has yet been found. Under the shale, orebodies called 'blankets' spread out horizontally in the limestone, following a zone that is at some places brecciated along the general direction of the fissures. It has been generally assumed in this case that the ores in the blanket deposits were deposited by waters ascending along the fissures, but Ransome, who made the latest and most detailed study of the district, thinks they are due to the mingling of these with solutions that moved laterally along the blanket zone.

In the Leadville limestone only small cracks have been observed in connection with the orebodies. Many of these cracks are traceable upward from the tops of the orebodies to the overlying porphyry, but, so far as known to the writer, do not extend down much below the workable orebodies. A similar conclusion might be drawn from Mr. Blow's description of the Iron Hill orebodies,

for when he prophesies that their extension will be found at a lower horizon, he expects them to go down not vertically but transversely across the stratification, and, as stated above, he believes that the ore solutions entered the limestone along the contacts of Gray porphyry sheets. His improper use of the word 'dike' to denote cross-cutting sheets has given rise to the idea that he supposed the solutions to have risen vertically along actual dikes to the present orebodies.

It is evident that the fractures that cross the limestone have played an important part in fixing the location of orebodies and in furnishing channels along which the ore-bearing solutions may pass from one horizon to another, but the general impression produced upon the mind of the writer has been rather that they served to divert or temporarily to arrest horizontally moving solutions (especially where, as can sometimes be proved, they are the final result of a strain that produced folding) rather than afforded continuous channels for solutions moving directly upward.

The relative superposition of orebodies at different horizons in a given region is, furthermore, such as to suggest that they were formed by solutions that circulated along contacts and bedding planes, and, incidentally, in joints and cracks that crossed the latter, rather than directly upward through a common vertical fissure that fed a series of superposed orebodies.

There is, moreover, an absence of evidence in the mineralogical composition of the ores and wall-rocks that these ore-bearing solutions had temperatures that were high enough to render their direct upward course inherently probable.

ULTIMATE SOURCE OF THE METALS.—The writer does not consider it appropriate in this place to go at length into the theoretical question of magmatic *versus* meteoric waters, which has been abundantly discussed of late in special articles and treatises, an increasing importance being given by many of our best students of ore deposits to the agency of magmatic waters in the formation of ore deposits which may be genetically connected with igneous eruptions. It seems better to postpone the discussion of the broad question of the ultimate origin of the metallic contents of the Leadville ore deposits until the map of the whole district shall have been completed rather than to attempt it in connection with the present description of a comparatively small portion of the area, in which the oxidizing agents have obscured much of the evidence. The original contention that the ores are genetically connected with the eruptive rocks seems abundantly confirmed and even strengthened by the development of the last twenty-five years. That their concentration in exceptionally rich bodies has come about through the agency of surface waters is also confirmed, and the study of the sulphide bodies has shown that this secondary enrichment has not been confined to the oxidized zone, but has extended below the ground-water level. The questions still at issue are:

1. Whether the sulphide ores were originally deposited as a precipitate exclusively from meteoric or from magmatic waters, or in part from both.

2. Whether the magmatic waters, if they were the transporting agents, reached the present locus of the deposits directly from below, or whether they came up along the general channels that carried the magma of the intrusive rocks, and, where this magma had spread out in sheets between the sedimentary strata, whether they followed in general the contacts between intrusives and sedimentaries or penetrated the mass of the latter along cracks and joints before depositing their lode.

3. Whether the deposits, or any part of them, were

formed by contact metamorphism—that is, by waters emanating directly from the cooling intrusive bodies, squeezed out, as it were, from the solidifying igneous mass into the adjoining sedimentary beds.

PREMIER DIAMOND MINE.—The Premier is the largest and most valuable individual diamond mine in South Africa, and it is probably one of the most valuable mines of any kind in the world. It is estimated that when its full plant is at work it will make profit at the rate of \$9,648,000 per year, the life of the mine on this basis being well over 50 years. Considerable interest will be taken in the attempt which is to be made at the Schuller mine to treat blue ground in tube-mills. The diamondiferous ground at this mine will not decompose when subjected to atmospheric agencies, so that it is necessary to disintegrate it by mechanical means. If crushers or rolls be used for this purpose the diamonds, which are brittle, although extremely hard, are broken as well as the matrix, but in the grinding action which takes place in a tube-mill it is thought that the diamonds will be separated from their enclosing minerals without being fractured. Experiments carried out on a small scale point to the feasibility of this arrangement, and if further experiments prove successful, the adoption of tube-mills will revolutionize the treatment of blue ground in diamond mines by doing away with the expensive and tedious process of flooring, which adds both to the cost and the capital expenditure. According to the new Transvaal diamond law, the Government has a right to take up to 60% of the profits of any diamond mines found in the colony, after allowing for all capital expenditure necessary to equip the mine. A law on the same lines has been promulgated in the Orange River Colony, although in this colony the maximum share that the Government can claim is 10 instead of 60%. It is scarcely necessary to repeat that nearly all diamonds manufactured in Amsterdam are of South African origin, and are sold under contract by the De Beers Co. to the syndicate in London, Amsterdam, and all others engaged in manufacturing diamonds being compelled to buy their 'rough' from the syndicate in London. On June 30 last a new contract was entered into between the De Beers people and the syndicate for five years, by which prices of the various series were raised 20%, the syndicate paying for rough diamonds now an average price of \$16.80. The average value per carat of the yield of the several mines last year was as follows: De Beers and Kimberley, \$14.86; Wesselton, \$10.50; Bullfontein, \$10.30; Dutoitspan, \$19.42. The diamonds produced by the De Beers realized \$27,051,627, as against \$23,168,919 for the previous year, an increase of \$3,882,708, this enhanced output being readily disposed of by the syndicate. The demand for diamonds is increasing to a great extent.

THE bulk of the gypsum produced in the United States as well as in foreign countries is manufactured into various plasters, such as plaster of paris, stucco, cement plaster, flooring plaster, hard finish plaster, etc. A steadily increasing quantity is being used as a retarder in portland cement. Refined grades of plaster are used in dental work, also as cement for plate glass during grinding, and as an ingredient in various patent cements. Considerable quantities are ground without burning and are then used as land plaster, or low-grade fertilizer, while smaller quantities are used in the manufacture of paint and paper, imitation meerschaum and ivory, and as an adulterant. The pure white massive form, known as alabaster, is much used by sculptors for interior ornamentation.

The Blow-out.

Written for the MINING AND SCIENTIFIC PRESS
By F. LYNWOOD GARRISON.

The term 'blow-out' is often heard among American mining engineers, especially in the desert regions of the West, and it denotes a geological condition for which we do not appear to possess a more elegant word. Mr. Andrew C. Lawson, professor in the University of California, recognizing this fact has proposed to modify the vulgar 'blow-out' to the more chaste 'blont.*' While I sympathize with him in this attempt to improve a homely English word, it seems to me the danger of not clearly conveying to the reader the thought of the writer, which is the prime object of written language, does not justify a doubtful gain in style. However, as my present object is not to quibble over this question of spelling but to discuss an interesting

A blow-out, as he appears to understand it, is a relatively small narrow mass of rock forming a ridge, rib, or dike, sometimes continuous over a long distance, often broken into detached masses, but always projecting above the surrounding surface of the ground as shown in the accompanying photographs. These protuberances are usually composed of quartz, often pure white, as in Fig. 1, but more frequently of silicified country rock standing out in bold relief by virtue of superior hardness and consequent resistance to erosion. The prospector does not differentiate between a blow-out and a vein, and whatever Prof. Lawson may have seen in any particular



Fig. 1. White Quartz Blow-out, Weaver District, Arizona.

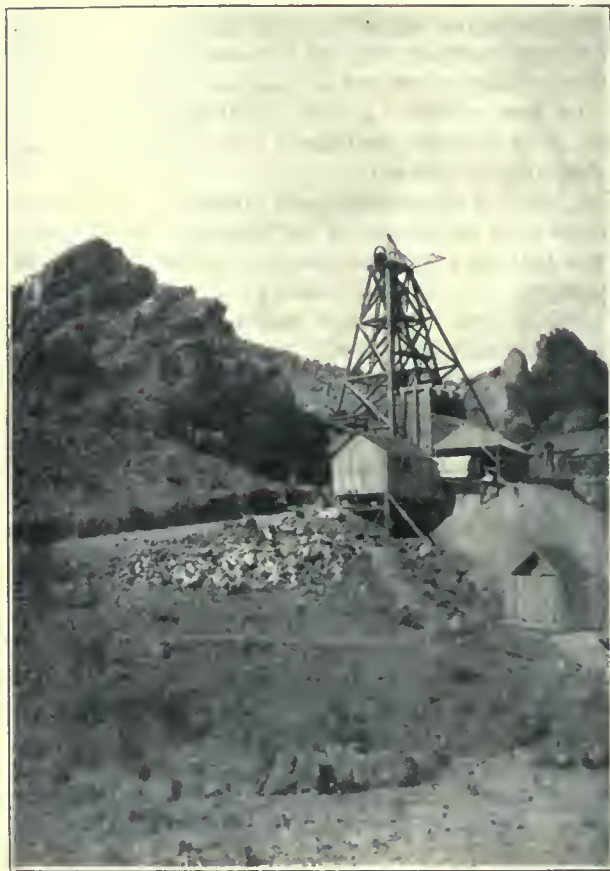


Fig. 2. Blow-out at the Gold Road Mine, Kingman, Arizona.

though not especially important geological subject, I shall employ 'blow-out' until some more appropriate word is suggested.

The origin of the expression is to be sought in the mind of the unlettered but often keen-witted prospector, whose conception of the creation of the earth is derived from the book of Genesis, although he may never have read the remarkable legend that begins the Pentateuch. When a covered porridge pot is over the fire, the steam, seeking to escape, carries with it some of the contents, which, adhering to the outside of the vessel, quickly harden in lumps and ridges. Here we have a phenomenon similar to that which the miner supposes took place in the interior of the earth, when his quartz blow-outs were formed. His conceptions of geological changes are nearly always cataclysmic; such a relatively slow and gentle force as erosion finds no favor in his eyes. Hence, when the prospector encounters great masses of quartz or other hard rock standing out in bold relief from the surrounding terrain he assumes them to be solidified exudences from the molten and seething interior. He appears to distinguish between a blow-out and a lava flow, or the dissected remnants of the latter.

locality it should not be contended that a blow-out may not be a vein or lode. The very existence of a blow-out necessitates some chemical change in the country rock due probably to forces and conditions similar to at least some of those active in the production of ore deposits. While a blow-out may not be metalized to any extent, it is often the accompaniment of orebodies, as for example in the case shown in Fig. 2 at the out-crop of the Gold Road vein near Kingman, in Arizona. The country rock here is granitic and the craggy blow-out of super-hardened rock accompanying this lode can be traced for a long distance. Fig. 3 shows the out-crop or blow-out of monzonite that accompanies the vein at the Techatticup mine at Eldorado Canyon, Nevada. That a blow-out is sometimes ore-bearing and can be mined, is shown by several other photographs in my possession. One is that of a prospect near the Colorado river in northern Mohave county, Arizona. Another illustrates a similar occurrence (in the same locality) accompanied by a rhyolite flow.

In the first case the ore is gold, and in the second copper and a little gold. In this connection it is interesting to observe that the blow-out and veins associated with the rhyolite carry copper, while there is none where there is no rhyolite. I have noted this condition

* 'The Copper Deposits of the Robinson Mining District, Nevada,' University of California Publications. Vol. IV., No. 14, pp. 324-325.

at several other prospects on the River Range in the northwestern part of Mohave county.

Photo 4 is that of a pegmatite or alaskite blow-out in the Weaver district, Mohave county, Arizona. It is actually a large pegmatite lens in schist that has been exposed by the erosion of a water-course. Curiously, it



Fig. 3. Monzonite Blow-out Near the Techaticup Mine, Nevada.

carries, as do most of the pegmatites of the district, some gold, but not enough to work.

It may be contended that a blow-out is simply an outcrop; this is true, but there appears to be a place for the term as intermediate between outcrop with which the miner usually postulates a mineral vein, and barren common country rock, or a capping of another equally barren associated rock. It implies something out of the ordinary yet not necessarily a vein; a geologist would call it a dike, but it does not always exactly fit into our conception of one, consequently we think Prof. Lawson is justified in his introduction of the word into technical literature, although we may not agree with him as to the spelling of it.

A blow-out is a bas-relief on the geological record, a line in the historical page. Like the history of mankind, the geological narrative repeats itself, but in either case never exactly. Both are records of the ceaseless change and activity of matter constantly taking new forms, no two ever alike.

From time to time amethysts are brought in from places in North Carolina and especially from the region of Rabun Gap, Georgia, on the North Carolina border, although no quantity seems to exist to warrant mining.

The Prospector.

Enquiries sent to this department are answered free of charge, if submitted by subscribers who are not in arrears. The full name and post-office address of the sender must be given, otherwise no answer will be made. Those who are not subscribers must accompany their questions with a fee of \$3 for each question. No assays are made.

W. J. M., of Octave, Ariz., sends a specimen of Chloritic Schist.

M. M. of Goldfield, Nev., sends a sack of ore, mainly Galena with Chalcopyrite.

The sample from Los Angeles marked G. E. W., is a talcose rock containing copper carbonate.

The mineral sent by W. E. L., of Reno, Nev., is massive Magnetite, which contains no tungsten.

A specimen of Sandstone, stained with iron, comes from Garden City, S. D. It might carry gold.

R. E. F. of Kingman, Ariz., encloses a fragment of Limestone, stained with malachite and azurite.

The blue color of the quartz sent from Nogales, Ariz., by F. W., is due to small needles of dumortierite.

The rock from Manhattan, Nevada, is a crystalline Limestone, with a little quartz. There is free gold showing in the seams.

A piece of Quartz and kaolinized Feldspar banded, probably from a rhyolitic flow, has been received from G. A. L., of Berkeley.

The specimens sent from Naranjera, Mexico, by P. G., are: No. 1, silicified Limestone; No. 2, silicified Limestone; No. 3, Slate; No. 4, Diorite; No. 5, Quartz Diorite; No. 6, Anglesite.

The samples from Ibapah, Utah, marked J. S. L. are:



Fig. 4. Blow-out of Pegmatite, in the Weaver District, Arizona.

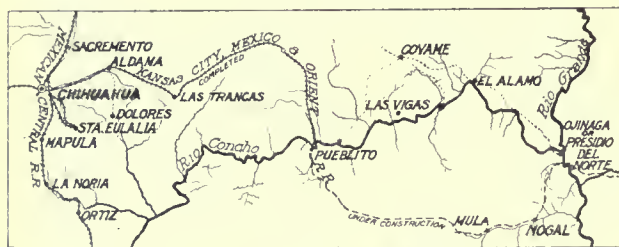
No. 1, green Chalcedony; No. 2, Granite Porphyry; No. 3, Mica Schist; No. 4, Chalcocite and Chalcopyrite; No. 5, specular Hematite.

C. E. D., of Beatty, Nev., sends: No. 1, Psilomelane; No. 2, Chalcedony; No. 3, Opal and Jasper; No. 4, Rhyolite; No. 5, Quartz and Feldspar; No. 6, Quartz Porphyry; No. 7, black Hornblende.

The Cuchillo Parado District.

Contributed to the MINING AND SCIENTIFIC PRESS
By R. H. BURROWS.

This place, known formerly as the Colony of Cuchillo Parado, was established during the time of the Spanish domination, in order, with other border settlements, to constitute a check against the tribes of savage Indians that ravaged the northern part of Mexico at that period. The present village is on the Conchos river in the middle of a valley three miles wide, two parallel mountain ranges bounding the valley on the east and west. The plain extends south to the Chilicote plains and northward beyond Coyame. While there is a large amount of land extending along the valley that might be cultivated, the amount planted at present is limited to a small area irrigated by the low ditches brought out of the river Conchos. The land is equally divided among 96 proprietors, who, at the present time, just raise the corn and wheat necessary to support life. Including the village of San Pedro, the production of wheat is about 15,000 bushels per annum with the same amount of corn. Most of this goes out to San Pablo on the Mexican Central; but as soon as the Kansas City, Mexico & Orient Railway reaches the Puerto del Chilicote, which is one day's haul from Cuchillo Parado, everything will be shipped over the latter line. Twenty wagons are employed at the



Sketch Map of Part of Mexico.

present time in carrying out grain and bringing in supplies.

The Aurora mine was worked for lead and silver by the first colonists of Cuchillo Parado, who smelted the ore on the spot, the place at that time being known as the Real of Cuchillo Parado. This name of Real (meaning Royal) was given by the centres of mining activity on account of the old Spanish law, which made all mines Crown property.

The surface ore was lead carbonate, with a good deal of silica and some silver, not very rich. On account of its distance from smelting centres, the mine has been only slightly worked for the last hundred years, being successively located and abandoned by different individuals, some of whom tried to smelt, but the scarcity of fuel and the cost of transportation of the bullion, with its low silver content, resulted in failure. Latterly, the mine was owned by Francisco Diaz, who sold it in 1904 to the Madero Brothers for P15,000. They formed a company styled the Compania Minera La Aurora y Anexas, and began work in December, 1905, running a cross-cut tunnel that tapped the bottom of the old workings, showing a vein 19 ft. wide of almost solid lead carbonate. Since that time, a winze 160 ft. deep has been sunk below the adit-level, and ore of 40% lead with average of 4½ oz. silver per ton has been shipped from the winze alone, without stopping. This winze shows lead on all sides; the ore has become of better grade in going down, the silica having almost entirely disappeared, the last shipments showing only six per cent.

A most interesting and valuable feature of the mine is the existence of a streak of pure crystalline wulfenite (molybdate of lead), for which they have been offered

P500 per ton delivered at the Monterrey smelter. The streak of wulfenite varies in thickness from a thread up to two feet. The amount available may be appreciated from the fact that the 160-ft. winze has produced 25 tons of pure wulfenite, worth P12,500, which is clear profit, as the lead ore taken out of the winze has already paid for the work. While the wulfenite will in all probability yield the greatest profit to the owners of the mine, the most profitable for the railroad will be the lead ore, thousands of tons of about 25% grade now lying on the dump and in the mine, awaiting the completion of the railway to Chilicote, when it is calculated to ship 50 tons per day, which will later be increased to 100 tons per day.

If the ore-shoot holds out, the intention of the owners is to put in a narrow-gauge railway between the mine and the station of Chilicote, 30 miles distant. In this case, coal will be required to raise steam for their railway as well as for power at the mine. The coal required, together with the supplies, will amount to fully a carload per day of freight to bring in to Chilicote, while the amount of ore to take out will amount to at least 50 tons, which in all probability will be later increased to 100 tons daily. The station of Chilicote will become of considerable importance as a shipping point for Cuchillo Parado and San Pedro as well as to the Aurora mine. Numerous zinc and copper prospects occur in the vicinity, some of which will undoubtedly become producers as soon as people find it easy to get into the country and work.

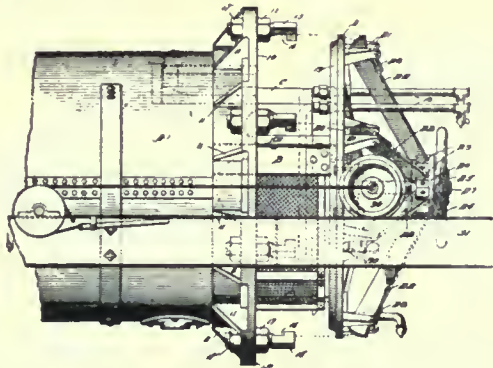
ASPHALT IN TRINIDAD.—For about a century the enormous deposits of asphaltum upon the island of Trinidad have been known, and many widely varying accounts thereof have been published. The asphalt of Trinidad is described as occurring in two forms—land pitch and lake pitch—although there seems to be no fundamental difference between the two varieties. The pitch lake is the original source of all the asphaltum which is exploited in the vicinity of the village of La Brea and between the village and the lake, the land pitch being material which has overflowed from the pitch lake through a crevice in its side and has descended the slopes to the sea. The surface of the lake is 138 ft. above the sea, its area is about 100 acres, and it is nearly circular in outline. The bed of asphalt forming the lake is from 18 to 78 ft. in thickness. The early reports described the material near the middle of the lake as being warm and soft. Now, however, the asphalt is firm enough to support teams at any point for a long enough time to permit of loading. Much water is present in crevices in the asphalt. The lake is thought to occupy the crater of an old mud volcano, and a constant supply of asphaltum is coming into the lake from subterranean sources. Excavations in the lake pitch, and in the land pitch also, fill again with asphaltum in a short time. The crude asphaltum has the following properties: Specific gravity, 1.28; hardness at 70° F, 2.5 to 3; color, brown.

THE production of bauxite in the United States in 1906 amounted to 75,332 long tons, valued at \$368,311. Compared with the production in 1905 of 48,129 long tons, valued at \$240,292, the production in 1906 has increased 27,203 tons—nearly 57%—while the average price per ton remains nearly the same. A reduction of perhaps 10c. per ton is the average difference noted in the 1906 price as compared with that of 1905. The per cent of increase in tonnage from the Georgia-Alabama district is about even with that of Arkansas, the latter State still leading in production, as it has done since 1903.

MINING AND METALLURGICAL PATENTS.

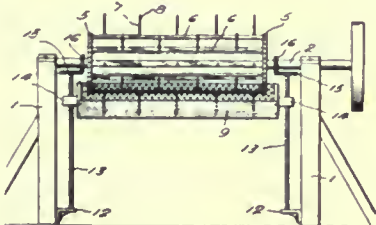
Specially Reported for the MINING AND SCIENTIFIC PRESS.

SLIMES-FILTERING APPARATUS.—No. 865,912; David J. Kelly and John M. Callow, Salt Lake City, Utah, assignors to the Kelly Filter Press Co., Salt Lake City, Utah, a Corporation of Utah.



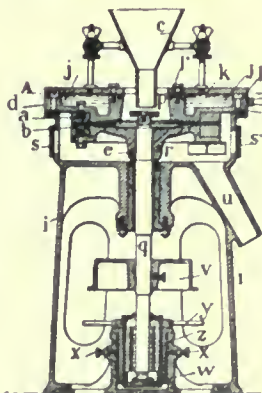
In apparatus of the character described, the combination of a tank having an open end and an annular series of independently-removable and adjustable locking-lugs, a removable head forming a closure for said tank, and means for securing the head to the tank, said means comprising a screw fixed centrally to the head, a rotatable follower engaging the screw, a collar loose on the follower, a series of radially-disposed levers having inner ends pivotally connected to the collar, guide lugs fixed to and projecting from the head near the periphery thereof and between which the outer ends of the levers are slidably mounted, said outer ends of the levers adapted to interlock with the lugs on the tank to secure the head to the tank, and springs acting on the outer ends of the levers to normally hold the latter against the head at the base of the spaced lugs.

ORE-CONCENTRATOR.—No. 865,859; Patrick Brophy, South Omaha, Nebraska.



In an ore-concentrator, the combination of a sludge-box, an endless apron, shafts and sprocket wheels for moving said apron, bevel gears on said shafts, threaded shafts provided with intermeshing bevel gears, said shafts passing through follower blocks connected to said sludge box, said threaded shafts being adapted to automatically lower the sludge box as the concentrates accumulate.

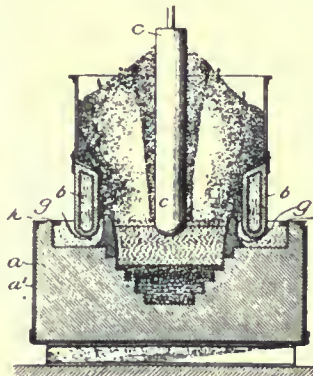
MILL.—No. 863,589; Irénée A. Chavanne and Barthélemy Ollagnier, St. Chamond, France.



A mill having millstones made of hard metal, such as hardened cast iron or steel, one of which is driven and pro-

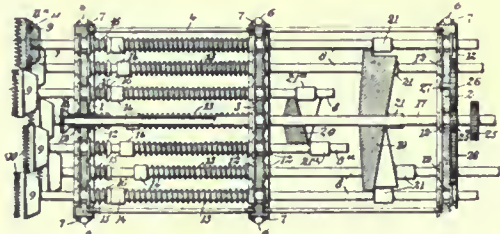
vided with grooves, the other of which and preferably the upper is fixed and provided with a smooth working surface cooled by a water circulation, the said stones being carried by carriers which are provided with distributing furrows the footstep of the shaft carrying the moving stone being adjustable in all directions for allowing of free expansion of the shaft in case of heating without throwing the stone out of adjustment.

SMEETING PROCESS.—No. 859,132; Frederick T. Snyder, Oak Park, Ill., assignor to Electric Metals Co., Chicago, Ill., a Corporation of West Virginia.



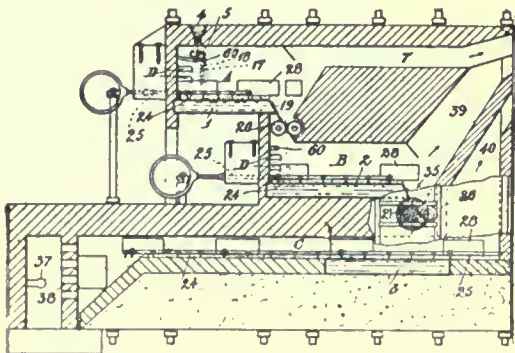
The process of smelting materials containing a compound of a metal which is volatile at the temperature of reduction, which consists in progressively feeding such materials toward a source of heat, continuously removing the non-metallic gaseous products from the surface of the charge, while preventing the escape of the volatile metal therewith, progressively advancing the residue toward the heat and thereafter separately removing the volatile metal at a further stage of the movement.

TUNNELING-MACHINE.—No. 864,704; Russel B. Sigafos, Helena, Mont., assignor to The American Rotary Tunnel Machine & Development Co., Denver, Colo., a Corporation of Colorado.



In a tunneling machine, in combination, a rotary frame, cutters journaled in said frame, means for rotating the cutters, and means for automatically reciprocating said cutters as they rotate.

FURNACE FOR THE TREATMENT OF REFRACTORY ORES.—No. 862,229; Walter P. Wynne and James H. Ballarat, Victoria, Australia.



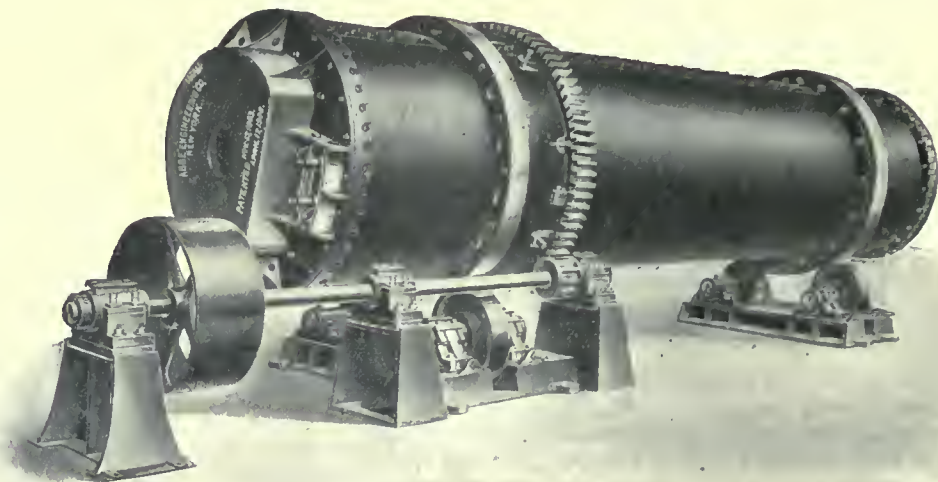
An improved furnace for the treatment of antimony gold ores and other refractory ores comprising a plurality of furnaces situated at different elevations and provided with fluid-cooled hearths and separate flues and means for feeding the material successively from one furnace to the other.

Improved Plunger Pumps.

An improved plunger pump has recently been placed on the market by the well known pump manufacturers, the Goulds Mfg. Co., of Seneca Falls, New York. The pump is known as a single-acting triplex plunger designed for a working pressure of 130 lb., which is equivalent to a lifting power of 300 ft. The capacity of these pumps for this lift depends upon the size of the plunger. Pumps are made in sizes from 4-in. plungers with 6-in. stroke, giving a capacity of 48 gal. per min. to an 8-in. plunger with 10-in. stroke, giving a capacity of 273 gal. per minute.

The various uses for which these pumps are designed include boiler-feeding, mine-pumping, solution-agitating work, pulp-circulation, and general water-supply for mills and smelters. They are designed for both direct and belt drive and can be furnished with either pullies or arranged for electric motor geared connection.

The general materials used in the manufacture of the pumps are of the best open-hearth steel castings with parts so fitted that they can be readily replaced in a few minutes if disabled. The valves for cold-water pumping are made



Abbé Tube-Mill, Looking From Feed End.

The Editor :

Sir—We have noted our letter which appeared in your issue of July 15, and very greatly regret that through error the cut which was used as an illustration was not that to which we referred in the letter. The cut used shows our Ideal Spiral Discharge, whereas what we desired illustrated

was the Spiral Ideal Feed. We are unable to determine how this error occurred, but assume that the engraver, who was making a number of halftones for us, failed to carry out our instructions correctly.

In order to correct the error made we would ask that you kindly give this letter space in your journal, and that you use the accompanying illustration. It shows some of our tube-mills of recent design.

ABBÉ ENGINEERING COMPANY.

PAUL O. ABBÉ, Secretary.

New York, July 22.

Catalogues Received.

THE LUNKENHEIMER Co. of Cincinnati is sending out a folder describing its blow-off valves.

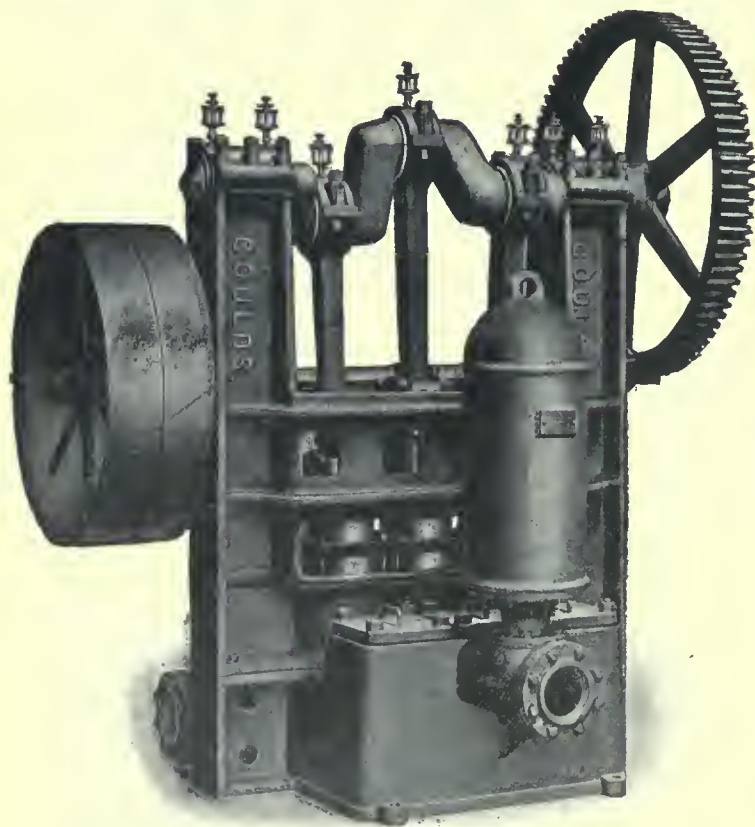
THE DE LA VERGNE MACHINE Co., of New York, sends us a folder describing its new vertical oil engine.

CHALMERS & WILLIAMS, of Chicago, have issued Catalogue No. 1, Sections J and K, describing the Rapid Cyanide Filter, and Chile mills.

THE CHAIN BELT Co., of Milwaukee, has published General Catalogue No. 35, a handsomely bound, well printed and arranged book of 288 pages, describing and illustrating its line of elevating, conveying, and power-transmitting machinery.

THE DENVER FIRE CLAY Co., of Denver, Colorado, has issued its illustrated catalogue and price list of assayers' and chemists' supplies, including muffles, crucibles, scorifiers, furnaces, chemicals, physical and general laboratory apparatus, etc., making a book of 350 pages that is a credit to its compilers.

THE INGERSOLL-RAND Co., 11 Broadway, New York, send us a 24-page leaflet, which gives a variety of information concerning the various machines for the coal mine manufactured by this company. Ten entirely distinct lines of apparatus are treated of, all up to date and of the highest efficiency in their respective classes.



Single Acting Triplex Plunger Pump.

of rubber discs on bronze grid seats with cylindrically wound springs. For mine use where hot water is encountered the valves are metal wing valves ground to seats. These pumps are kept in stock on the Pacific Coast by Woodin & Little, of San Francisco, who are the agents of the Goulds Mfg. Company.

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TABLE OF CONTENTS

Editorial:	Page.
Notes.....	411
The Greatest Gold Mine.....	412
The Crisis in San Francisco.....	412
General Mining News.....	415
Special Correspondence.....	420
Butte, Montana.....	
Mexico City.....	
Toronto, Canada.....	
Chihuahua, Mexico.....	
Salt Lake, Utah.....	
Denver, Colorado.....	
Johannesburg, Transvaal.....	
Concentrates.....	426
Discussion:	
Plumbing a Deep Shaft.....	F. W. McNair 427
Speculation or Investment?.....	F. E. Willson 427
Searching Questions.....	T. S. 428
Articles:	
A Handy Windlass.....	F. S. Beckett 429
Gold Measures of Tangier, Nova Scotia.....	George A. Packard 430
Re-timbering the Kearsarge Shaft.....	Lee Fraser 432
Progress on the Rand.....	434
The Combination Mine.—II.....	Edgar A. Collins 435
Record Sinking.....	438
Power Transmission by Manila Rope.....	G. P. Hutchins 440
Mining and Metallurgical Patents.....	439
The Prospector.....	438
Departments:	
Personal.....	414
Market Reports.....	414
Dividends.....	415
Books Received.....	415

Editorial.

IN THE OPINION of engineers well informed concerning economic conditions in the West, the prices of labor, fuel, supplies, and machinery, when compared to five years ago, have been so increased as to represent an advance of 30 per cent in the total cost of mining. Any large enterprise run to its full capacity incurs a shortage of labor, delays in freight, and scarcity of fuel. An industrial readjustment is inevitable.

AN ENORMOUS PRODUCTION of lead is coming from the mines of the Cœur d'Alene, but it is not likely that it will be maintained, unless an important new mine is opened up. The Bunker Hill and the Federal group are both diminishing their shipments. A diminution will help the smaller mines by strengthening the lead market. One miner's gain is another's loss, and we like to see the little fellow prosperous.

THE SUBSERVIENCY of the press is well exemplified by the *Graphic*, a wretched sheet published at Los Angeles, which wonders "why Mr. Harriman failed to include Los Angeles in his itinerary during his recent vacation visit west." It is then explained that the "Wall Street wizard hastened east" to meet the directors of the Illinois Central railroad. "But for this incident, Mr. Harriman would have come to Los Angeles, where all of us, his most loyal subjects, would have paid him that homage due to him who holds within his keeping our destinies." Drivel; but true of a certain kind of sycophantic corruptionist, typified by legislators and some editors.

WE PUBLISH a short note on the rapid sinking of a large shaft in the Transvaal. A seven-compartment shaft, 8 feet wide and 39 feet long, was sunk 204 feet in one month, at a vertical depth of nearly 2,000 feet. This record was made by Mr. Charles B. Brodigan, an Associate of the Royal School of Mines—a fact we are glad to chronicle for reasons it is not necessary to state. The previous best was only one foot less, made in 1898, when the Simmer West shaft, 7½ feet by 31 feet, with five compartments, was sunk 203 feet by Mr. Leslie Simson, a graduate from the College of Mining in the University of California—a fact we are pleased to note, for reasons that are obvious. We shall be glad to hear from Columbia, the Tech., Houghton, and other schools of mines, or are they better at deep thinking than fast sinking?

REFLECTIONS concerning the growth of the smelting industry of North America are suggested by the sale of the Grant smelter, at Denver, which is to be dismantled and the site of it used for other purposes.

This will remove a landmark from the outskirts of Denver. The plant was built 25 years ago by the Omaha & Grant Smelting Co., and is named after James B. Grant, once governor of Colorado and still a notable citizen of the centennial State. He was one of the pioneers of an industry that has developed continental proportions. In 1878, just after graduating from Freiberg, Mr. Grant went to Leadville and built a small one-stack smelter at that silver-mining centre, then beginning to boom. Within a year the plant was increased to eight furnaces. In 1880 Edward Eddy and W. H. James, who owned a sampling works, joined him in the metallurgical venture. Later the enterprise became the Omaha & Grant Smelting & Refining Co., with a lead smelter at Denver and a refinery at Omaha. This was the nucleus of a group of smelters upon which the American Smelting & Refining Co. was organized, the Guggenheim plants, at Denver, Pueblo, and Leadville remaining outside as the chief competitors. When they were drawn into the scheme in 1900, it became almost a monopoly, but it was not until several years had passed that the older element became dominated by the Guggenheim brothers. Since then the company has prospered, its watered common stock has been quoted higher than the preferred shares, and the financial operations of the dominant directors have become worldwide; incidentally, the smelting industry has grown apace, so that other companies have been able to get a foothold. Now the Grant smelter is to be dismantled, the 68 acres of land are to be sold to the Rock Island Railroad Co., the tools going to the Globe plant. It may be noted that the Grant smelter has been idle since July 1903 when it was closed down by a strike, which was a good excuse for ceasing work with a plant that was not economical, although profitable, and had become obsolete. "By the wayside of progress lie the broken images of the past."

The Greatest Gold Mine.

IN THE COURSE of a recent tabulation of the gold produced by the richest mines now in operation, we picked the Robinson mine at Johannesburg as the greatest gold mine in operation today. It may interest our readers to consider the following facts: The capital of the Robinson Gold Mining Co., Ltd., is £2,750,000. Milling operations started in January, 1888. Since then 3,212,189 tons have been mined and 2,686,315 tons have been milled. Of the total ore mined, 21.7 per cent has been sorted out. The total working expenses have been £3,552,267 or 26s. 5.4d. per ton. The gold produced has amounted to 2,253,809 oz. fine, and the value of this production has been £9,474,678, or 70s. 6.5d. per ton. The working profit has been £5,922,411 or 44s. 1.1d. per ton. The dividends to the end of 1906 were £5,064,687 and since then £275,000 more has been distributed. At the present time the monthly profit is £65,095 and the yield monthly is worth £95,997. There is a reserve of gold on hand amounting to 23,791 oz. fine, equivalent to £101,100. It is estimated that at the present rate of production the ore actually measurable will supply the mill for

twelve years, that is, the reserves total 4,500,000 tons. As the yield is \$14 and the cost \$5, the profit yet to be won amounts to over \$40,000,000. By the time it is exhausted the Robinson will have yielded a net profit of \$70,000,000. By the end of 1920, this mine will have ceased to be profitable, but long before then the company owning it is likely to acquire new territory, either by purchase or consolidation, so that the life of the enterprise may be prolonged for many years beyond the present known capacity of the mine. The exact amount of ore available is known in this case simply because another company, the Robinson Deep, is working the same lode where the dip carries it across the vertical side-line into the adjacent ground. The operations of this deep-level mine (the Robinson Deep) have afforded an accurate test of the character of the ore at the very bottom of the Robinson; thus the future of the latter is both assured and limited. These facts are sufficiently eloquent without further embellishment. They emphasize the wonderful possibilities of gold mining.

The Crisis in San Francisco.

FROM THE INTERIOR of Eastern Siberia, a mining engineer writes, saying: "San Francisco is to be congratulated on landing the grafters in jail." Similar messages have come to us from South Africa and Western Australia, in fact, from all those distant places into which the ubiquitous mining engineer penetrates in the pursuit of a nomadic calling. The word has been flashed round the civilized world announcing that San Francisco is trying to redeem herself from shame, and the news of an approaching civic rehabilitation has called forth a cheering word from all true men possessed of hope in the betterment of humanity. For the plight of San Francisco is more than a local episode, it is a sign of the times. Californians may be glad to see the city they love asserting her self-respect, Americans may be pleased to note another effort at municipal house-cleaning, but in its world-wide aspect San Francisco illustrates a resolute advance in the evolution of representative government, despite a failure ghastly in its completeness and shameful in its consequence.

Progress is being made. The former mayor, Eugene Schmitz, the first violin of a vaudiville, and a charlatan who exploited the labor party, has been convicted of extortion. Abraham Ruef, an impudent lawyer who acted as advisor and go-between to the mayor and the corrupting chiefs of corporations, has confessed and awaits his sentence. Louis Glass, the general manager of the telephone company that bribed the city officials, has been tried, convicted, and is in jail. Others indicted on similar charges are either undergoing or awaiting trial. There is a probability that a number of unscrupulous leaders of finance and their hirelings will feel the heavy hand of justice. The prosecution conducted by the District Attorney, assisted by a fearless advocate, Francis J. Heney, and supported by a public spirited rich man, Rudolph Spreckels, has succeeded in making the law triumphant. Public opinion has been aroused,

the self-respect of the community has been touched, and the conscience of the people has been awakened. This has given momentum to the wheels of justice. One of the first fruits of the new order of things has been the appointment of Edward R. Taylor to serve as mayor during the few months intervening between Schmitz's conviction and the next election. Mr. Taylor is a graduated physician, the head of a law college, and an author. His administration has won general commendation.

But the crisis has not been passed. On the fifth of November the municipal election takes place. Three tickets have been nominated: Labor, Republican, and Democratic. Ordinary political affiliations do not count; there are three groups, led respectively by labor agitators, spoilsmen, and those, irrespective of party, who want to set San Francisco right before the world. General opinion among professional men, merchants, and reformers favors the election of the present mayor, Mr. Taylor, who has done well under trying conditions. He has been placed on the Democratic ticket and is also receiving the support of an independent movement. Against him are two candidates, an ordinary politician nominated by the Republican convention and an agitator nominated by the Labor party. As the Labor vote at the last election represented 56 per cent of the total, it is obvious that the Republican and Democratic elements favorable to Taylor must be strengthened by some of those that supported Schmitz two years ago. This is likely, for Schmitz and his gang have been thoroughly exposed. Should the labor leader be elected every burglar alarm in San Francisco will go off automatically, for in this City the labor domination is the synonym of municipal debauchery. While the laboring man of America has a freedom of opportunity that is the glory of this Republic, while he has improved the conditions of his life far above his brother in Europe, he has utterly failed as yet to exhibit any civic spirit; he shows only a class spirit, an anxiety to get the sugar plums and to use public office in the interest of his friends. That is what makes the San Francisco experiment under Schmitz so instructive. A democracy ruled by its least intelligent members is no better than an oligarchy of ignorance. Nor is this a sneer against the workman; it is merely the truth about his leaders. We have found by bitter experience that the best workmen are not the leaders; on the contrary, the more thoughtful are dominated by the irresponsible agitator, who is usually a laborer only in name. Until the working people learn to choose fit representatives, they will be unfit for government. Another evil factor is the public service corporation, that is, the companies controlling the street-car, telephone, water, gas, and electric light facilities of the City. It is to these and to the labor party that San Francisco owes her degradation. The corporation officials made common cause with the labor politicians, until bribery and extortion were rampant and the city's motto might well have been: "An honest man is the loneliest work of God." But honest men are here, they have been ciphers so long simply because they failed to perform their civic duty.

Between the corrupting capitalists, predatory financiers, and unscrupulous exploiters of municipal franchises on the one hand and the venal officials elected by ignorant laborers, gamblers, saloon-keepers, and professional politicians on the other hand, between the corrupting corporation and the corrupted office-holder, is the large body of professional men, merchants, and plain people. The present mayor represents these, so does the present Board of Supervisors (or aldermen), so does the District Attorney and the other members of the prosecution that is bringing criminals to account.

It is a case of the people against the plunderers, it is a contest between civism and incivism, between order and anarchy. In this struggle the better aspirations of a democratic community ought to have the help of the press; they get but little. It is a fact that the daily newspapers of San Francisco are ineffective in leading public opinion, for they are controlled by men without character and edited by men without principle; when they mean to be decent they are only puerile; and when they try to be forceful, they succeed chiefly in being vile. Among the weekly journals, of which there are several irresponsible publications, there was one—*The Argonaut*—that we expected to be the exponent of civic regeneration. Our contemporary has missed a great opportunity to serve the highest interests of this community; to him the effort of the District Attorney's office to enforce the law is a persecution rather than a prosecution, to him the contest between the properly elected law-officers of the community and the criminals that have debauched this municipality is a war between "factions." A similar notion perpetuated the labor troubles in Colorado and Idaho; it is an interpretation that undermines every attempt to apply the law. Criminals always think themselves relentlessly pursued; wrong-doers invariably believe themselves persecuted. San Quentin is full of 'innocent' men.

Despite a reptile press, despite putrid politics, despite the conspiracies of capital and labor, this city of San Francisco is going to assert herself as the exponent of representative government in America. The earthquake did not destroy her, nor the fire; she broke the chains that bound her in dishonor, she shall rise above the mire of politics, to be the forerunner of a better day, to be an example of advanced municipal administration. America as a whole, San Francisco in particular, is going through a crisis due to the rapid development of certain phases of industrial civilization. Corporations and labor-unions are drunk with power. The march of events has been too fast for legal procedure. Lawyers seem to live mainly to impede justice. Public opinion is amorphous. The press is powerful mainly for evil. But these are all phases of a shifting stage of progress. We are having the measles and the whooping cough of representative government. It is an unpleasant but necessary experience. Out of it will come a new order of things, as much better than the ignorant tyranny of an American today as it is better than the queer anachronisms of a European yesterday. We are optimists, for we have been talking with pessimists.

Personal.

ARTHUR L. PEARSE is at Cobalt.
CLAUDE T. RICE is here from Butte.
T. D. MURPHY is on a visit to El Oro.
C. W. PURINGTON is at Vladivostock.
GEORGE A. SCHROTER is in New York.
LLOYD A. WOMBLE is at Reno, Nevada.
CHARLES BUTTERS is in the City of Mexico.
C. B. PRIDE returned to Spokane last week.
HORACE V. WINCHELL is at Wallace, Idaho.
ALFRED VON DER ROPP has returned from Europe.
N. E. LINSLEY has returned to his home in Spokane.
E. M. LAMONT, of Denver, is on a visit to New York.
ROBERT YOUNG has returned to Tacoma, Washington.
E. M. ALDRICH, of Spokane, is in the interior of Alaska.
J. PARKE CHANNING is expected at Breckenridge, Colorado.

DAVID T. DAY is returning from an oil conference in Roumania.

BEN S. REVETT was here this week. He has returned to Denver.

W. A. CALDECOTT has gone to Guanajuato and El Oro, Mexico.

F. W. HOAR has moved from Tombstone to Superior, in Arizona.

JOHN HAYS HAMMOND is very ill at Gloucester, Massachusetts.

S. F. EMMONS has returned to Cananea, after a short stay at Denver.

GEORGE E. JAMME is now at St. Paul and will be at Seattle shortly.

A. M. HUNT has returned to San Francisco from Peyton, California.

M. P. BOSS is engaged in engineering work near Salt Lake City.

WALTER R. CROSBY, of Virginia City, leaves this week for New York.

C. H. MUNRO, of Portland, will leave this week for Colombia, South America.

ARTHUR J. HOSKIN is professor of mining in the Colorado School of Mines.

THOMAS RICHARDS, manager of the Nundydroog mine, has returned to India.

F. C. NEWTON has been appointed assistant superintendent of the Selby smelter.

SIDNEY HANSARD has returned to Seattle from a visit to southern British Columbia.

WALTER HOVEY HILL, who has been in Nevada recently, has gone to Seward, Alaska.

NORRIS ENGLISH has reached San Francisco from Alaska, on his way to Mexico.

C. B. LAKENAN is acting manager for the Nevada Consolidated Copper Co., at Ely, Nevada.

E. W. PARKER was in a train wreck in West Virginia, but luckily escaped with slight injuries.

W. CLAYTON MILLER, general manager for Federal Mg. & Smelting Co., was in Spokane last week.

F. AUSTIN WILSON, of Boston, is in charge of mining operations in Gunnison county, Colorado.

G. C. KAUFMAN is manager of the mining department of the A. S. & R. Co.'s office at Asientos, Mexico.

EDWARD SKEWES has been appointed mineral agent for Lord Falmouth and will live at Truro, Cornwall.

EARL B. CRANE has recently been appointed general manager of the Trethewey mine at Cobalt, Ontario.

J. CLEVELAND HAAS has an office in the Hyde Bdg., Spokane, where he is engaged in general mining practice.

L. J. CORBETT has opened an office in 501 Empire Bdg., Spokane, to engage in general electrical engineering practice.

FRED WARTENWEILER, now engaged in cyanidation at Phillipsburg, Montana, has been in South Dakota and Colorado.

W. C. BRACE, of Denver, is here on his return from the Dalton mine, in Madera county. He is going to Pioche, Nevada.

EDWARD FINK has left Seattle for Alamos, in Sonora, Mexico, to superintend the erection of a new copper-leaching plant.

NORMAN ROWE, manager for the Guanajuato Power Co., is recovering from a severe attack of typhoid. He was extremely ill at one time.

R. J. KILVERT, for a number of years superintendent of the Golden Fleece mine at Lake City, is now in charge of the Raymond mine at Ohio City, Colorado.

ELY C. HUTCHINSON has been appointed Pacific Coast representative of the Power & Mining Machinery Co., of Milwaukee, with headquarters at 150 First street, San Francisco.

L. W. TRUMBULL, of Laramie, has returned to the University of Wyoming as Professor of Mining, after spending the summer in Colorado and California, and will remain there until January 1.

A. B. CARPENTER, of the firm of Carpenter & Brennon, mining engineers resident in the City of Mexico, has arrived in Oakland on his way to Los Angeles, to establish a branch office in that city.

Latest Market Reports.

LOCAL METAL PRICES—Oct. 3.

Antimony.....	13@17c	Quicksilver (flask).....	838@39
Copper.....	20@23c	Spelter.....	7@ 7.75c
Pig Lead.....	4.85@ 5.80c	Tin.....	40.50@42c

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.

Date	Electrolytic Copper	Lead	Spelter	Silver
Sept. 26.....	14 ³ / ₈	4 ³ / ₄	5.28	67 ³ / ₈
" 27.....	14 ³ / ₈	4 ³ / ₄	5.28	67 ³ / ₈
" 28.....	14 ¹ / ₂	4 ³ / ₄	5.33	67 ³ / ₈
" 29.....	Sunday.	No market.		
" 30.....	14 ³ / ₈	4 ³ / ₄	5.33	67 ¹ / ₂
Oct. 1.....	14 ³ / ₈	4 ³ / ₄	5.38	66 ⁷ / ₈
" 2.....	14 ³ / ₈	4 ³ / ₄	5.38	66 ³ / ₄

ANGLO-AMERICAN SHARES.

Cabled from London.

	Sept. 25.	Oct. 2.
	£. s. d.	£. s. d.
Camp Bird.....	0 17 6	0 17 9
El Oro.....	1 5 0	1 5 0
Esperanza.....	2 0 7 ¹ / ₂	2 0 7 ¹ / ₂
Dolores.....	1 5 0	1 3 9
Oroville Dredging.....	0 16 3	0 16 0
Tomboy.....	1 8 1 ¹ / ₂	1 7 6

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

COPPER SHARES—BOSTON.

Closing prices. Closing prices.

Adventure	1½	Michigan .....	.....
Ahmeek	75	Mohawk .....	.....
Allouez	28	Nevada Con.....	.....
Amalgamated	59¾	North Butte .....	.....
Arcadian	4	Old Dominion.....	.....
Atlantic	9	Osceola .....	.....
Balaklala	5	Parrot .....	.....
Bingham Con.....	8	Phoenix .....	.....
Boston Con	14½	Quincy .....	.....
Butte Coalition.....	15¾	Raven .....	.....
Calumet & Arizona	107	Rhode Island .....	.....
Calumet & Hecla .....	.....	Santa Fe	2 3/8
Centennial .....	.....	Shannon	10 1/4
Con. Mercur .....	.....	Superior & Pittsburg	9 3/4
Copper Range .....	.....	Tamarack	65
Daly-West .....	.....	Trinity	13
Franklin .....	.....	United Copper com	47
Granby .....	.....	Utah Copper.....	34
Greene-Cananea, cif	8¼	Victoria	4 1/2
Isle Royale	15	Winona	4 3/4
Mass .....	.....	Wolverine	109

(By courtesy of E. F. Hutton & Co., 490 California St.)

MINING STOCK QUOTATIONS—NEW YORK.

	Closing Prices.	
	Sept. 25.	Oct. 2.
Bingham Central.....	1	3 $\frac{1}{4}$
Boston Copper.....	18 $\frac{1}{2}$	15 $\frac{1}{2}$
Cumberland Ely.....	6 $\frac{3}{4}$	6 $\frac{1}{2}$
Dolores.....	5 $\frac{1}{2}$	5 $\frac{1}{2}$
El Rayo.....	2 $\frac{1}{2}$	2
Guanajuato Con.....	3 $\frac{1}{4}$	3
Glroux Con.....	5	4 $\frac{3}{4}$
Greene Con.....	11	12
Nevada Con.....	9 $\frac{1}{2}$	9 $\frac{1}{2}$
Nipissing.....	7 $\frac{3}{4}$	6 $\frac{3}{4}$
Tennessee Copper.....	31	30 $\frac{1}{2}$
Tonopah Ex.....	1 $\frac{1}{2}$	1 $\frac{1}{2}$
Tonopah-Belmont.....	21 $\frac{1}{2}$	17 $\frac{1}{2}$
Tonopah.....	11	10 $\frac{1}{2}$
United Copper.....	48 $\frac{1}{4}$	47 $\frac{1}{2}$
Utah Copper.....	23	21 $\frac{1}{2}$

(By courtesy of Hayden, Stone & Co., 25 Broad St., New York.)

COMSTOCK SHARES. SAN FRANCISCO.

Closing Prices.		Closing Prices.	
Oct. 2.		Oct. 2.	
Alpha.....	10	Julia.....	10
Andes.....	26	Kentuck.....	11
Belcher.....	51	Mexican.....	72
Best & Belcher.....	1.12	North Gould & Curry.....	22
Bullion.....	24	Occidental.....	30
Caledonia.....	56	Ophir.....	1.54
Challenge Con.....	23	Overman.....	15
Chollar.....	23	Savage.....	89
Confidence.....	1.05	Scorpion.....	07
Con. Virginia.....	90	Sierra Nevada.....	67
Crown Point.....	39	Silver Hill.....	40
Exchequer.....	42	Standard Con.....	2.50
Gould & Curry.....	32	Union Con.....	56
Hale & Norcross.....	1.03	Yellow Jacket.....	2.32
Argonaut.....			3.75
Hayseed.....			60

CALIFORNIA—Closing Quotations, Oct. 2.

SOUTHERN NEVADA STOCKS.
San Francisco, Oct. 3.

Atlanta.....	\$ 30	Laguna.....	1.20
Belmont.....	1.95	Little Tonopah.....	1.00
Columbia Mtn.....	26	Manhattan Con.....	35
Combination Fraction.....	1.30	Midway.....	71
Daisy.....	95	Mizpah Extension.....	10
Fairview Eagle.....	1.05	Mohawk.....	15.00
Florence.....	3.65	Montana Tonopah.....	1.95
Gold Bar (Bullfrog).....	40	Nevada Hills.....	4.25
Gold Bar (Goldfield).....	45	Red Top.....	3.00
Goldfield Con.....	6.05	Sandstorm.....	30
Goldfield of Nevada.....	1.20	Silver Pick.....	36
Gold Kewanas.....	31	St. Ives.....	46
Great Bend.....	39	Tonopah Extension.....	1.45
Jim Butler.....	59	Tonopah of Nevada.....	10.00
Jumbo.....	3.00	Tramp Con.....	21
Jumbo Extension.....	1.40	West End.....	60

(By courtesy of W. C. Itelson, 368 Bush St.)

Structural Material.

Base prices f. o. b. cars San Francisco.

Brick, common, per M.....	88.50
Cement, domestic, per bbl.....	\$2.00@2.10
Cement, foreign, per bbl.....	\$2.75@3.25
Firebrick, domestic, carload lots, per M.....	\$37.50
Firebrick, English.....	\$50@45
Lime, per bbl.....	\$1.15
Lumber, Ord. Dimension Stock, f. o. b. Gray's Harbor, per M.....	\$12@13
Mining timbers, f. o. b. Gray's Harbor, per M.....	\$41
Nails, per keg.....	\$3.25

Books Received.

'Tables of Minerals,' by Samuel L. Penfield. 88 pages. John Wiley & Sons. This is the second edition of an excellent little book by a first-rate man. The author, lately deceased, was professor of metallurgy in Yale University, and one of the best teachers of science in America. The tables and lists of minerals will be found most useful to busy men. Price, one dollar. For sale by the MINING AND SCIENTIFIC PRESS.

Dividends.

On October 4, the Bunker Hill & Sullivan Mining & Concentrating Co. paid dividend No. 121, of \$120,000. This makes the amount of dividends paid since January 1, \$1,740,000, and the total to date, \$9,606,000.

General Mining News.

ALASKA.

The Hadley smelter has started again, for a short run. Improvements in the way of a new hot blast, dust chamber, and heater will be put in. Two new dams have been built to help out the water supply, and a steam shovel, for unloading cargoes of coke and ore, is being put in.

ARIZONA.

GRAHAM COUNTY.

(Special Correspondence).—Engineers report that the New York-Arizona mine at Morenci is showing enough gold-bearing ore to warrant the erection of a mill and reduction works. The new assay office of the company is about completed; as soon as it is in running order, the manager will sample the entire property and make estimates of the ore reserves.—Shipments of ore from the Gold Belt mine have ceased temporarily, and the management will hold the ore on the dump until better prices can be realized for it. Work at the mine continues with a larger force than formerly. The gold and silver in the ore warrant development and give the company the advantage of not having to rely on the copper. At the 200-ft. level, development work is most gratifying, and as soon as the water at this point can be handled, the vein will be prospected. The water in the main shaft is causing some trouble at present, but it will be of great advantage in the operation of a mill, and will save the necessity of pumping from the San Francisco river, several miles distant. The management is looking into the cost of erection of a mill, and as soon as the estimates are completed, provision will be made for its speedy erection.

Phoenix, Oct. 1.

MARICOPA COUNTY.

Prescott men have purchased the Keystone mine and work will soon start.—New machinery will be installed at the Alvarado mine.—The Rincon mill is running one 12-hr. shift per day, and work is progressing on the Marcos property.—The Octave Gold Co. is sinking a 100-ft. shaft on the east end of the Leviathan, the work being in charge of Charles Minetti. There is lots of activity at the main Octave workings.—A. D. Cupples will soon start the stamp-mill on his Gold Dollar property.—Oscar Jennings has resigned his position with the Hale M. & M. Co., to work the Monte Cristo mine that he has bonded. Alex. Spear succeeds him.

MOHAVE COUNTY.

The big mill of the Victor Gold M. Co. at Vivian will be ready to run as soon as the power-plant at Needles is finished.—It is rumored that a large number of the McCracken claims have been jumped.

CALIFORNIA.

AMADOR COUNTY.

Reports state that a 16-ft. vein of good ore has been struck on the 2,600-ft. level of the Gwin mine.—L. L. Cuneo and Frank Burg, who own the Pinevetti mine, near Defender, have run a tunnel 500 ft. and some good samples have been taken from a two-foot vein.

BUTTE COUNTY.

The Pennsylvania dredge sprung a leak last week and sank, breaking the stacker and throwing the electric motor overboard. Men are at work raising the boat.

NEVADA COUNTY.

A good strike is reported from the Union Hill mine, near Grass Valley, on the 300-ft. level. The ore carries gold and lead.—The power line from Colgate to the Alaska mine, at Pike City, has been completed.—The Arctic mine, in the Washington district, has been bonded by O. F. Greeley and E. A. Work, to Sweet, Bacon, and Eckhart.—Some manganese ore has been encountered in the Aurora mine, on Randolph flat.—A Keystone driller has been delivered at Buena Vista, to be used in prospecting Bear river and Greenhorn creek.—A tunnel has been started on the Gold

Bank property at Maybert, owned by T. A. Kohler. A scheme for a long tunnel to develop a group of mines in that district, including the Gray Eagle, Eagle Bird, Bluejay, and others, is being considered.

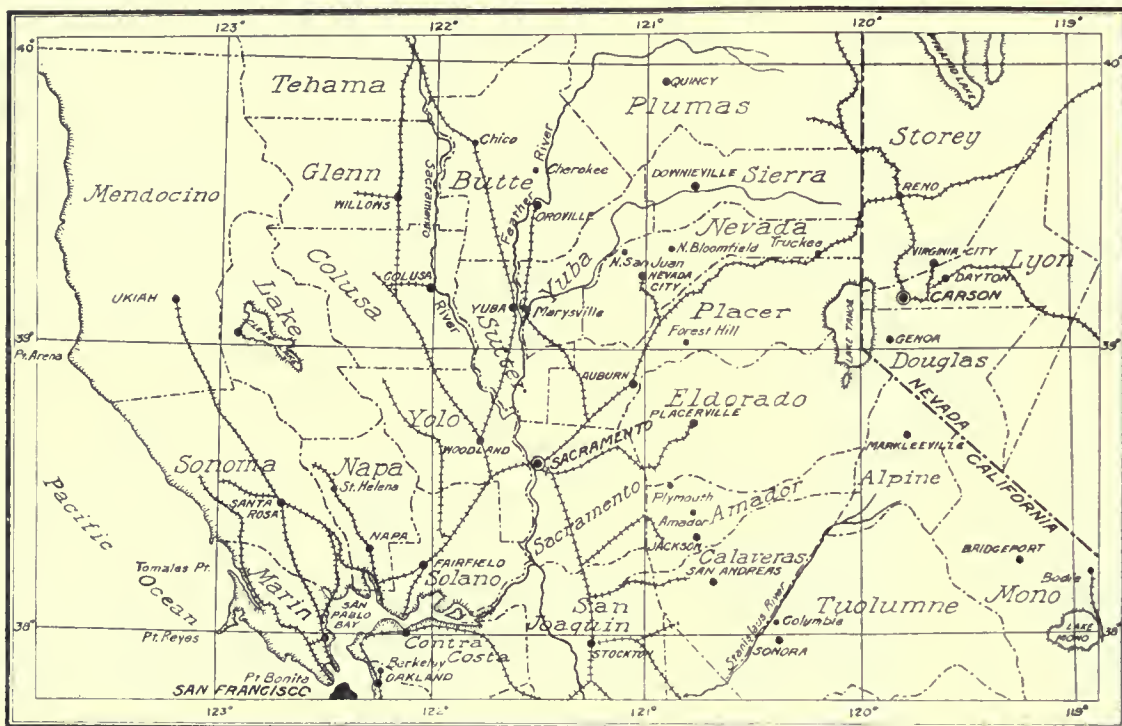
PLACER COUNTY.

At the El Dorado, 14 men are working for David Ray, and 12 are employed at the Home Ticket by A. Dixon.—The old Crater mine, which is down about 700 ft., is being unwatered.—Fletcher & Rood have a new boiler at the Slope mine, and the shaft will soon be free of water.

SIESTA COUNTY.

The Mammoth smelter is to continue in operation, in spite of the drop in copper. The Mammoth Copper M. Co. is owned by the U. S. S. & R. Co., and Frederick Lyon is the local manager.—The Copper Mtn. Con. M. Co. has started hauling machinery from Copley to its Sugar Loaf mine. The new equipment includes an electrically-driven compressor, and air-drills, the Northern California power line having been tapped at the Little Nellie mine. Fred

is in ore. The property comprises 10 claims and has been opened up by 500 ft. of tunnels and drifts. Henry Callahan is superintendent.—A short tunnel on the Wellington has disclosed a promising vein of copper and gold ore.—At the Bloomfield the main tunnel is in 340 ft. A second tunnel is in 160 ft. Both are in excellent ore. J. H. Adams is manager.—A strike has been made in the 80-ft. tunnel on the Copper King. The vein is over 20 ft. wide, carrying gold and copper. The lower tunnel is in 280 ft. and is being driven to tap the main lode at a depth of 350 ft.—An 8-ft. vein of ore was recently struck in the upper tunnel on the First National claim of the Joe Creek company. The main tunnel is in 70 ft., in sulphide ore.—The main tunnel on the Advance is in 500 ft. Excellent ore is being extracted. The mill is running steadily.—A body of ore running \$80 per ton has been struck in the cross-cut tunnel on the Temple & Arbuckle mine. The vein is 8 ft. wide.—The company which recently purchased the Beaudry mine is making arrangements to reopen the property. A large force is engaged in laying pipe, cleaning out



Map of Central California.

Grotofend is the manager for the company.—J. W. Pinder is the superintendent of the Donkey mine, in the Furnaceville district.—The Ingot railroad, to connect Bella Vista with Ingot, is being graded, and the coke for the smelter of the Great Western G. Co., for which M. E. Dittmar is manager, will be hauled over it. There is available at the smelter a six month's supply of coke.

SIERRA COUNTY.

Twenty-five men are employed at the Young America gravel mine, and good results are coming from the clean-up. Eight men are employed at the South Fork mine, where the main tunnel is in 4,700 ft., and rapidly approaching the gravel channel.—William McDougall is doing assessment work on the Bald Mountain Extension mine.—H. S. Tibbey and Frank Rogers have just completed their annual work on the Secret Canyon and Mt. Vernon mines.—Development work will be resumed next spring on the High Sierra mine, once known as the Gold Canyon, which has a vein parallel to the Plumbago. The property is about seven miles above Moore's Flat, and across the river from the German Bar mine, which the Buch brothers are operating.

SISKIYOU COUNTY.

(Special Correspondence).—A large amount of development work is under way at the Blue Ledge mine. Over 200 men are on the payroll, and large reserves of copper ore being blocked out.—At the St. Albans, the 288-ft. tunnel

ditches, and installing two giants.—Three giants, pipes, and other machinery are being installed at the Grouse Creek.—Work has commenced on a new tunnel on the Champion, which will be driven 500 ft.—Good ore was recently struck in the bottom of the shaft in Tunnel No. 3. The 10-stamp mill is being put in shape for immediate service. O. H. Poor is superintendent.—Operations have been resumed at the Johnson mine. The tunnel will be driven 50 ft. farther to tap the main vein.—The McKean mine, near Callahan, is shipping high-grade concentrates to the smelters. Much development work is under way.—The Scott Bar mine has been bonded by R. A. Murray to Eastern and San Francisco capitalists for \$200,000, to be paid in 12 equal monthly installments.—The mill at the Mt. Vernon is running regularly on good ore. A small force of men is engaged in developing virgin country.—A 2-stamp mill is being installed at the Ball property.—Development work is under way at the Doolittle Creek mine.—It is reported that F. H. Dakin, Jr., has decided to purchase the group of claims recently bonded by him.

Yreka, Sept. 26.

TRINITY COUNTY.

Joseph Porter has retired from the management of the Bonanza King mine, and has been succeeded by Mr. Littlefield. About 60 men are employed, and 10 stamps are kept running. A long lower tunnel is being driven to cut the lode at a greater depth.—Summer prospecting in the upper

Coffee Creek district is about finished. Wiser & Wommer have run a tunnel 140 ft., treating some ore from an 18-in. vein with a hand mortar. Two *arrastres* are being run below the Nash mine on the Rose and Woodmeier claims.

TUOLUMNE COUNTY.

The small prospecting mill at the Cardigan mine, below Columbia, has been started.—A good vein of copper ore has been struck four miles east of Copperopolis.—The 100-ft. shaft of the North Fork mine is being cleaned out, as are also the Uncle Sam and Driesam shafts. Some good-looking rock is coming from the Duffield claim.—Good ore has been uncovered on the Intevonor and Fleming quartz mines, near the McAlpine.

COLORADO.

GUNNISON COUNTY.

(Special Correspondence).—Near Elko Park, the Empress Mining Co. is shipping ore running high in lead and 30 oz. silver. They have only about 500 ft. of development work on the property.—The Elk Mountain Mining Co. at Irwin is getting ready to ship. The ore carries gold, silver, and lead. About 1,000 ft. of development work has been done. The ore will be hauled three miles to the Irwin switch. M. A. Pennington is superintendent, and F. Austin Wilson of Boston is the treasurer of the company.

Gunnison, Sept. 25.

(Special Correspondence).—McMichaels and Waggoner of Pitkin have a contract for driving an adit on the Sandy Hook on Ohio creek. About 150 ft. has already been driven by hand. Power drills are being considered for the property. Adjoining the Sandy Hook on the south, the Belzora-Bassick Mining Co., of which Richard Hightower is superintendent, has recently installed a 20 by 20 in. Norwalk compressor furnished by the Hendrie & Bolthoff company and Leyner Model 6 drills.—Drills are being operated in both the Denver City and Mutual. The adit on the Denver City is in 330 ft. and 600 ft. in the Mutual. The company is doing development work with the expectation of cutting several known veins ahead of them. R. G. St. John is manager.—The Gold Lynx property, which consists of nearly 5,000 acres owned principally by A. E. Reynolds of Denver, is practically closed on account of the volume of water which they are obliged to handle. The water seems to be receding as the fall weather approaches, the summer springs drying up considerably, which it is believed will cause the flow of water to cease. The tunnel is in 3,000 ft. and it is expected work will be resumed as soon as the water subsides. At present they are installing 20 stamps. The stamps will be run temporarily by steam, but it is the understanding that an electric power plant will be installed by the Gold Lynx Co. sometime next year on Quartz creek, near Ohio City. The mill will use amalgamation followed by concentration. Wilfley tables will be employed. The ore is the same character as at the Raymond, which adjoins them on the south. The main tunnel has already encountered five veins on the property and has plenty of mineral ground ahead of it. A concrete floor is being put under the plates and a tank will be placed below in order to catch any amalgam or qulek which may be dropped. The formation on the Ohio creek side is granite carrying gold, while over the hill on the Quartz creek, or Pitkin side, it is limestone formation. The silver is in the contact.—The Raymond Con. M. Co., for which E. M. Lamont, general manager, is working 45 men and running the mill 24 hours per day. Recently a new ore-shoot was opened in the 950-ft. level, which ran from two to seven ounces in gold. They are handling on an average 100 tons per day through the mill. The mill consists of 20 stamps, four Card and four Wilfley tables. O. K. Lewis is resident manager and R. J. Kilvert, superintendent.—The Ashland Mining Co. has been succeeded by the Carter Mining Co., Carroll M. Carter, president and manager. This company is operating what is known as the Carter tunnel. They recently increased their holdings to nearly 700 acres, running clear through the gold belt. The main tunnel is being driven by two Model 6 Leyner drills. The tunnel is now in 3,700 ft. Two Model 5 Leyners are used in the drifts. It is estimated they have

\$458,000 worth of ore blocked out in the upper levels and a raise is being made from the main tunnel to tap it. An encouraging feature is that the ore on the lower levels is higher grade than above. Over \$100,000 has been blocked out on the tunnel level. It is expected they will cut the veins of the Grand Prize and Cortland and afford them transportation facilities. A 14 by 16-in. Leyner compressor furnishes the air for the drills, and 20 men are employed at present. No ore is being shipped, but it is the intention of the president to soon erect a mill to handle the ore. The company is capitalized at \$450,000. The Grand Prize on Carter Mountain in Jones' Gulch is shipping two to three cars of ore per week that nets over \$100 per ton.

Ohio City, Sept. 25.

NEVADA.

ESMERALDA COUNTY.

Goldfield shipped more ore during the week ending Sept. 27, than in any previous week in the history of the camp. The total was 4,129 tons, estimated to be worth \$400,400. The smelters received 590 tons; the Nevada Goldfield Reduction Works, 1,651; the Western Ore Purchasing Co., 1,418; and the Combination mill, 560 tons. The Mohawk Jumbo lease on the Jumbo Extension contributed largely to this production, but the Little Florence and the Mohawk Combination were doing development work and were not heavy shippers. During the week, the Nevada Goldfield Reduction Works received ore as follows: Mohawk mine, 546 tons; Mohawk Combination, 368; Red Top, 210; Little Florence, 277; Jumbo dump, 250. Value, \$165,100. The Western Ore Purchasing Co. received consignments of ore as follows: Mohawk Jumbo, 1,185 tons; St. Ives lease, 32; Hayes & Monnette dump, 68; Little Florence, 143. Estimated value, \$141,800. The Combination mill treated 563 tons of ore that ran \$80 per ton and the Mohawk mine shipped 500 tons of \$100 ore to Miller. Some high-grade ore is being taken from the Codd lease on the St. Ives. The vein is six inches wide.—The Florence L. & M. Co. has let a contract to sink its shaft from the 385 to the 485-ft. point. From the bottom a cross-cut will be run to tap the junction of the Reilly vein and the vein running through the leased ground.—The shaft of the Mohawk Red Top Lease Co. is down 300 ft. and it is expected to cut the Red Top vein at the 450-ft. point.—The Mohawk Combination lease has cut some good ore in the north cross-cut on the 206-ft. level.—A station is being cut on the 450-ft. point of the Laguna, and connection will be made on that level with the Red Top workings, by means of a drift and raise. Later, connection will be made with the Mohawk workings.—The Consolidated company has ordered a 150-hp. engine for the Mohawk, and the main shaft will be sunk to a depth of 1,000 ft. The working shaft of the Combination will be enlarged.

NYE COUNTY.

Tonopah shipped 5,952 tons of ore over the Tonopah & Goldfield railroad, during the week ending Sept. 26. The shipments as reported by the Western Ore Purchasing Co. were as follows: Tonopah Mining Co., 1,812 tons to the smelters and 2,520 tons to the mill at Miller; Tonopah Extension, 153; Jim Butler, 73; Midway, 54; Belmont, 50 tons to the smelter and 1,290 tons to the mill at Miller. In addition to the above, the Montana-Tonopah treated 956 tons at its mill, which amount is not included in the total shipments. The Liberty district shipped five tons.—All 40 stamps of the Montana-Tonopah mill were dropping, for the first time. This was done by using steam at the mine and switching all the electric power to the mill. Probably 20 stamps will have to be hung up again, as the Nevada-California Power Co. has not water enough to make the required power.

(Special Correspondence).—The prospecting shaft on the property of the United Mines Syndicate, eight miles east of Rhyolite, has reached a depth of 155 ft. Much water is being encountered. A 15-hp. hoist was erected July 1, and commenced operations at the 100-ft. level. Sinking was continued until water was struck at 145 ft., making it necessary to close down until a Cameron pump could be installed. This pump is in operation, being run by compressed air. The orebody will be cross-cut at the 200-ft. level,

BRITISH COLUMBIA.

There has been a marked increase in the smelter production. Five out of the seven furnaces at the Trail smelter are in operation. The following is the record of tonnage shipped from the Rossland mines during the week ending September 21: Centre Star, 3,780 tons; Le Roi, 1,925; Le Roi No. 2, 560; White Bear, 140; Nest Egg, 29 tons. Total 5,405 tons or a total of 193,592 tons for the year to date.—Ore is being stoped in the Idaho property of the Centre Star, it being taken out through the fourth level of the Centre Star mine. The sixth level of the Centre Star, on which but little work has been done recently, is being pushed into the Idaho, to intersect the ore at a lower level. Ore is also being stoped on the first and second levels of the War Eagle, and the Iron Mask is producing.—At Le Roi, diamond-drilling continues in the Spitzee. In the Le Roi mine, exploration continues west of the Josie dike.—The development of level No. 7 continues at Le Roi No. 2.—Work on the California and Giant tunnels and on the vertical shaft, is being pushed.—Development continues at the Inland Emplre, and the Nest Egg lessees shipped a car of ore during the week.

At the Trail smelter, in addition to Rossland ore, ship-

low-grade, and a large amount of zinc ore has been developed.—The Sailor mine will be unwatered, a tram constructed from the Sailor shaft to the Minnie mill of 10 stamps, and a pipe-line laid from Rice creek.—The new air-compressor at the Creseent mine is in operation.—The annual meeting of the Providence Mining Co. will be held in Greenwood early in October.—Contractors have finished the raise from the Granby Curlew tunnel to the intermediate level, thereby improving the ventilation of that part of the mine.

MEXICO.

SINALOA.

C. F. Whittier and Isaac Bryson, of Los Angeles, have taken over La Palma mine in the Rosario district; the ground adjoins the famous Tajo mine of the Bradbury family, and has been worked for years by natives.

SONORA.

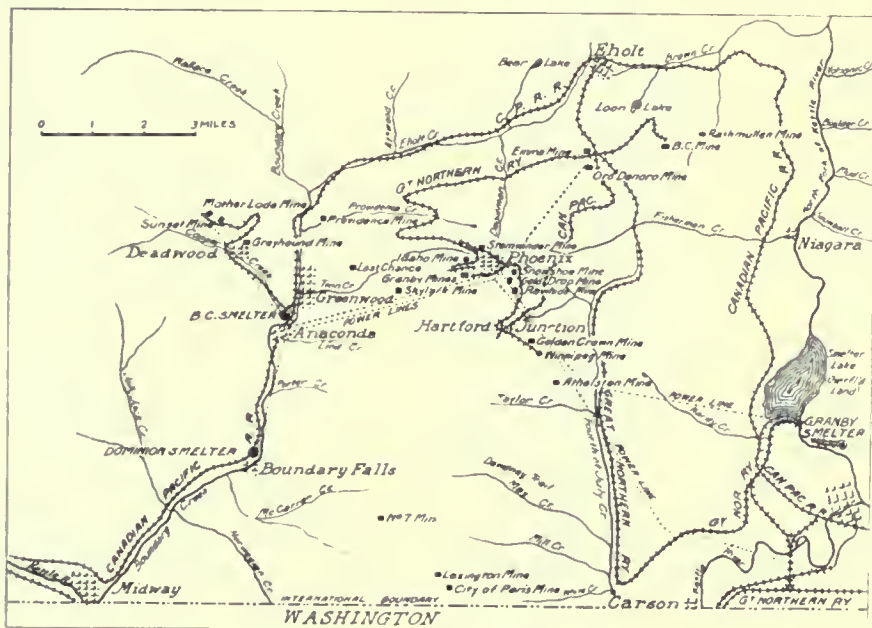
The Tomlinson & Norton Mining Co. has been organized in Cananea to take over the San Augustine group, also known as Los Guijas, about 20 miles below the Chispas. The property, which was purchased from Jesus Carrillo and Antonio Aeuna, has not been worked for 23 years; 3,000 ft. of workings stand open. A 10-stamp mill and cyanide plant has been ordered.—

Work is progressing in a satisfactory manner on the Fundicion smelter of the Douglas Copper Co., which will be blown in about November 1. With the first unit of this smelter in operation the company will treat 250 tons of ore per day at an estimated cost of \$12 per ton. The ore is reported as valued at \$34 per ton in copper, gold, and silver. As the ore runs 6% copper, the output will be 9,000,000 lb. copper annually at a cost of 10c. per lb. It is estimated that this company has enough ore already blocked out in its mines to keep the smelter going for five years.—N. C. Banks is the manager for the Black Mountain M. Co., at Cerro Prieto.

An important discovery was recently made in the lower Limestone tunnel of the Phelps Dodge Indiana Sonora, when ore was struck 150 ft. in the Sierra de Cobre.

At the Campana shaft, the foundations for the new pump have been completed at the 800 station and the pump is being set.—On the fourth floor from the tunnel level in the Democrata, some fine malachite has been opened. The winze from the 500-ft. level is going down in ore, and a third compartment in the shaft is being provided for by raising.—Charles McHenry, superintendent of the South Cananea, has received orders from the New York office to keep the pumps running and the property opened. Negotiations are under way in London for financing the new company recently organized to handle the property.—Ore has been encountered in the tunnel on the Native claim of the Ortega. Work on the rest of the property is stopped, pending the arrival of pumps for the shaft.

The management of the Greene Cananea has decided to temporarily curtail production, which will probably mean that stoping will be confined to the mines of Capote basin and Cananea Central properties. Elisa and Puertocitos furnish desirable fluxing ore, and will probably not be affected.—The Ortega tunnel on the Native claim is still in ore.—Five shafts are being sunk on the Cananea Nueva property. Encouraging reports are heard from the Arizpe Development Co.'s property.—At a recent meeting of the Cananea Eastern M. Co., the old directors and officers were re-elected.—Development continues in a satisfactory manner at the Santa Cruz copper mines, 30 miles southeast of Nogales, toward Cananea. A good showing of ore is reported.



Part of British Columbia.

ments from other mines were as follows: Snowshoe, Phoenix, 1,838 tons; St. Eugene, Moyle, 86; Vancouver, Slocan, 22; North Star, East Kootenay, 48; Ryner, 20; Slocan, 23; Arlington, Erie, 22; Standard, 26; La Plata, 89; Hewitt, 21; Montezuma, 22; Grizzly, 28; Whitewater, 71 tons.—At Northport there was received during the week 1,925 tons of ore from the Le Roi mine.

The Boundary district made a heavy shipment during the same week, the ore being distributed as follows: To Granby smelter from Granby mines, 23,180 tons; from Emma mine, 580 tons. To B. C. Copper Co.'s smelter from Mother Lode, 5,246; from Snowshoe, 2,560 tons. To Dominion Copper Co.'s smelter from Brooklyn, 1,509; from Idaho, 1,216; from Rawhide, 3,591; from Sunset, 1,396; from Mountain Rose, 254 tons. Total shipments for week, 41,734 tons and for year to date, 885,997 tons.—Boundary smelters during the week treated as follows: Granby smelter, 19,622; B. C. Copper Co.'s smelter, 8,881; Dominion Copper Co.'s smelter, 7,968 tons. Total treatment for week, 36,471 tons, and for year to date, 867,353 tons.

Summarizing the shipments from southeastern British Columbia for the week shows the Boundary district sent 41,493 tons; Rossland, 7,112; and East of the Columbia river, 2,782. The smelter receipts were: Grand Forks, 23,760; Greenwood, 7,786; Boundary Falls, 7,968; Trail, 6,526; Northport, 2,171; Marysville, 600; total, 48,811 tons of ore.

The Cariboo mill, in Similkameen, has been overhauled. Thirty men are employed in mine and mill. The ore is

Special Correspondence.

Butte, Montana.

Decrease in Copper Output.—Statistics for September.—Butte Central & Boston.—The Lexington Mine.—Barnes-King Affairs.—Subduing an Underground Fire.—The Snowstorm.—Local Stock Depression.

The reduction in the Butte copper production, which began in July, reached a little more than 60% in September, and the total output for the month was little more than 11,000,000 lb., compared with the normal production of 28,000,000 to 30,000,000 lb. per month. During the last week of the month there were no further reductions in the working forces at the mines and smelters, but the big companies were prepared to make a still further reduction, or close the mines entirely, if necessary, to bring about an improvement in the metal market. The estimated production in September was 11,329,800 lb., from 172,200 tons of ore. The total ore tonnage and copper production credited to the various companies were as follows:

Companies.	Tons of ore.	Pounds of copper.
Boston & Montana.....	30,000	2,040,000
Anaconda.....	36,000	2,160,000
Butte & Boston.....	7,500	457,500
Washoe.....	4,800	292,800
Parrot.....	6,000	348,000
Trenton.....	5,400	324,000
North Butte.....	18,000	1,440,000
Coalition.....	24,000	1,608,000
Original.....	27,000	1,647,000
East Butte.....	6,000	450,000
Pittsburgh & Montana.....	4,500	337,500
Miscellaneous.....	3,000	225,000
Total.....	172,200	11,329,800

Very few of the new developing companies have been compelled to shut down on account of the low stock market and scarcity of money for mining purposes, and the indications seem to be that all will be able to weather the storm. The Butte Copper Co. is the only one that has entirely suspended development work, though it had long ago lost the confidence of the majority of its shareholders by the unexpected reorganization about a year ago.

The Butte Central & Boston Co. has about 15 sets of lessees at work in the Ophir mine, a number of first-class men having sought leases since the decrease of work at the big mines. No ore was shipped from the Ophir during September, but during the latter part of the month a great deal of development work was done. One set of lessees on the 500-ft. level have opened a fine body of ore west of the shaft and main cross-cut. The ore-body is six feet wide and has been opened by drift about 20 ft. In driving the drift they have broken down 15 to 18 tons of ore per day, which they expect to increase to 50 tons when they begin stoping. The ore assays 45 oz. in silver and \$3.20 in gold. Another set of lessees are sinking on an orebody on the 300-ft. level on the east side of the cross-cut. On the same orebody one lessee took out about \$40,000 worth of ore from the stopes, but the pay-streak pinched out. Other lessees are now raising from the 300 to see if they can not find the rich shoot again. On the 500-ft. level the company is driving a cross-cut and has advanced 36 ft. in the south vein. The vein carries some streaks of ore, but nothing of any account. In the opinion of Manager Cameron pay-ore will be found near the hanging wall. The vein is estimated to be about 70 ft. wide at that point.

The Lexington mine of the La France Co., which is also a silver producer, had to curtail its output on orders from the smelter because of the large percentage of

copper the ore carries. Then, because of the suspension of operations at the Corra mine, from which the Lexington derived its air, it had to close altogether. The La France Co. is now engaged in installing an air-compressor of its own at the Lexington mine and expects to be in shape to resume production in a few weeks. The company laid off about 75 underground men, but is employing about 85 on the surface in construction work on the new concentrator and separator plant. This work is being pushed as rapidly as possible and the company hopes to have the plant in operation early in November. It will include a dryer, crusher, concentrator, and separator. The Lexington has never been hindered by the strike of machinists as their demands for an increase of wages were granted.

John Gillie and C. W. Goodale of the Barnes-King Development Co. have been at Kendall making an examination of the company's mines, and will make a detailed report to the stockholders, the report to cover not only the condition of the property and of the treasury, but also the financial history of the flotation and transfer of the mines to the company by the promoters, regarding which there have been some ugly rumors. It has been claimed by independent experts that the promoters' reports, under which the company took over the property, proved incorrect, and that the property did not cost within some hundred thousand dollars the amount represented to the company. However, Mr. Gillie says the mines are good and their condition satisfactory, and that the payment of dividends can soon be resumed. Because of the adverse reports and the exposure of the former management many stockholders lost confidence and have been selling their holdings all the way from \$5 down to \$2 and \$1.90 per share.

The Boston & Montana and Butte Coalition companies are still trying to subdue the fire in the old Leonard mine, the gas and smoke from which has stopped work in a portion of the Minnie Healey mine and compelled a shut-down of the Leonard and West Colusa. It is believed that the fire will be absolutely under control by the time a resumption of operations at all the mines, which have been closed as a result of the copper curtailment policy, is ordered. The Boston & Montana Co. is sinking an up-cast shaft right over the fire, which is burning on the 600 and 700-ft. levels, and has also secured permission from the Butte-Montana Co. to sink the Alex. Scott shaft 200 ft. deeper and drive a cross-cut from the 1,200 ft. point to get under the fire. It is the object to clear the mines of all the gas and then wall in the fire, confining it from the top, bottom, and sides, as has been done with the fire in the St. Lawrence mine of the Anaconda Co., which has been burning constantly since 1889. The fire in the Leonard has been the most stubborn the mining companies of Butte have ever had to contend with, and its effect on operations is especially serious because nearly all the mines in that part of the district are connected by numerous workings.

The Snowstorm mine at Mullan has made net earnings of \$498,013 during the last fiscal year, and of that sum \$359,910 was paid out in dividends. Notwithstanding the earnings and dividends, the stock of the company has gradually declined from about \$5 per share to \$1.90. During the past year, according to a statement by W. D. Greenough, the manager, the mine produced 87,503 tons of ore, of which 77,782 tons were shipped direct to smelters and 9,721 tons were treated at the company's leaching plant.

General financial and mining stock conditions have had their effect on the local Stock Exchange, and quotations have gradually declined during the past year. Butte & Arizona dropped gradually from \$3 to 31c. per share,

notwithstanding the better condition of the property. Other stocks have dropped in the same proportion. Butte & Bacorn declined from about \$1 to 12c., and the public, which has been badly bitten by such local mining stocks as Butte Copper Exploration, Barnes-King, and Butte Copper, has entirely dropped out. It will be a long time before confidence is restored.

Mexico City.

Presidential Message Before Congress.—Principal Features of Speech by Diaz.—Prosperity of the Country.—Development of Mining.—Failure to Merge Railroad Companies.

On the evening of Sept. 16 the third period of sessions of the 23rd Congress of the Republic of Mexico was formally opened in Mexico City by the annual message of President Diaz delivered before the combined assemblage of senators and deputies, and while the message would prove interesting to the readers of the MINING AND SCIENTIFIC PRESS, space does not permit of quoting

the whole of it, but there are portions of the message of sufficient importance to those who are interested in Mexico that it would seem a neglect not to give the substance of such portions in this letter. The President stated that "the various controversies which naturally arise between neighboring nations like Mexico and the United States have been adjusted of late in a spirit of genuine harmony and good-will on the part of both Governments, demonstrating the stability and cordiality of the relations between the two countries. * * * Labor troubles have not ceased altogether, but the demonstrations have diminished considerably both in frequency and intensity—so that in general there was no occasion for the authorities to act in order to put a stop to them or to prevent perturbations of public order. * * * The Geodetic Commission has, in the south of the country, completed the accurate scientific work necessary for measuring the 98th meridian of longitude west of Greenwich * * * and has concentrated its outfit in the north of the Republic, selecting vertices on the plains of Tamaulipas right up to the boundary line with the United States, where its operations will be carried on in conjunction with similar work in the neighboring republic, by virtue of an international agreement between the two countries. * * * Arrangements have been made by the Geodetic Commission to draw up a magnetic chart of the Republic. * * * The Sonora Scientific Commission has completed a wagon-road between the town of Torin and the nearest station of the railway from Guaymas to Guadalajara. * * *

The steady development of the mining industry is worthy of note. From the beginning of January to the end of June of the present year there were issued 2,600 title-deeds to mines embracing 40,698 pertenencias (100,000 acres) as against 2,000 deeds for 30,650 pertenencias (75,000 acres) during the preceding six months. * * *

In the second half of the last fiscal year 20 contracts were entered into for the utilization of watercourses under Federal jurisdiction of an aggregate volume of 589,300 litres per second and 36 title-deeds were issued either confirming old water-rights or in connection with new concessions. * * * The new construction of railways subject to Federal jurisdiction aggregates 277 kilometres

(173 miles), the largest being those from Columbia to Jarita (the coal beds near the Texas line), the Pan American from Ocotlan to Atotonilco, the Cananea, Rio Yaqui & Pacific, and the line from Navajoa to Guadalajara. Additions to other roads aggregate 207 km. (129 miles). The total length of the railway system in the Republic is 22,392 km. (13,995 miles). The earnings of the Tehuantepec National Railroad from January to June last as compared with the same period of the previous year have shown an increase of 265 %.

* * * The Federal revenue collection for the fiscal year 1906-7 shows a surplus of over P20,000,000, the total receipts being P11,000,000 in excess of the previous fiscal year. And in consequence a material reduction in the stamp tax and other Federal contributions went into effect May 23 last, proving the Government's solicitude in behalf of the tax-paying classes. * * * Mexico had, up to four or five months ago, succeeded in keeping out of the influence of the disturbing financial factors, but scarcity of available funds has arrested the invest-



Sinaloa and Part of Sonora, Mexico.

ment of foreign capital in the country, obliging the banks to strengthen their holdings in cash and refuse aid to new undertakings except of undeniable solidity.

* * * The monetary situation is improving, the new gold coins increasing from P60,000,000 on April 1 last, to P68,000,000 at present; the subsidiary silver from twenty-two to thirty million pesos in the same period. The conditions of the foreign markets has prevented the merger of the National Railroad of Mexico and the Mexican Central Railway from being consummated, and though a decree was issued July 6, laying down the lines along which the new company is to be incorporated, it does not seem wise under present circumstances to go on as yet with the incorporation or with the financial operations to which it must give rise." (Since the reading of the President's message there have been rumors to the effect that the merger had fallen through; that controlling interests in the Mexican Central Railway had made conditions to which the Mexican Government would not comply.) Concluding, the President said: "The foregoing review proves to you that the efforts of the Executive to give added impetus to all branches of the public administration have not been barren, seeing that all of them show the progress which for some time past has reflected the growing prosperity of the Republic. Not even the transient stringency of foreign markets has been able to arrest our country's progressive movement, for though it has prevented the immediate realization of important combinations involving the railways of the Nation, it has not sufficed to curtail the yield of the public revenue, which has continued to expand, or to occasion any appreci-

eable contraction of the currency. It is to be hoped that this prosperous situation in Mexico will be maintained."

Toronto, Canada.

Progress at Cobalt.—New Machinery and Mills.—Sale of the La Rose.—Ore Shipments.—Discovery in Temagami.—New Trail to the Yukon.—The Dominion Coal Litigation.

The leading mines at Cobalt show great activity in development work and installations. The Nipissing has closed a contract with Cobalt Concentrators, Ltd., for the erection of a concentrating mill on their property, near the Kerr Lake spur of the railroad, now in course of construction. The work has been commenced. The present force employed numbers about 300, but will be largely increased shortly.—A new shaft and ore-house on the Keudall vein has been put up. The shaft has reached a depth of 90 ft., and drifts have been started at the 60-ft. level. The vein, which averages 5 in. wide, continues to look well. A new power-house is being erected for the installation of two 125-hp. boilers and a 17-drill compressor, for working the veins at the southwest end of this part of the area. Ore is now sampled and crushed on the ground previous to shipment.—The McKinley-Darragh is sinking a shaft on the extension of the Kendall vein. Their new concentrating plant is steadily in operation, treating 15 tons of ore per day. Another compressor of 15-drill capacity will shortly be installed.—The O'Brien is getting in one of the biggest plants in the camp, including two 100-hp. boilers, a 20-drill compressor, and a dynamo. The main shaft has reached a depth of 320 ft.; another shaft is down 85 ft., and a third 50 ft. Drifts and cross-cuts have been made to the extent of 2,000 ft. An electric apparatus for tracing veins, operated by Williams, the inventor, has been in use all summer. At the Trethewey driving and cross-cutting at the 50-ft. and 100-ft. levels have been steadily carried on, about 1,500 ft. in all having been done. Four good veins carrying native silver have been found. It is reported that the La Rose mine has been sold for a high figure to English capitalists.—Shipments of ore from the Cobalt district for the week ending Sept. 21 amounted to 230 tons, from the following mines: Buffalo 30 tons, Coniagas 32, La Rose 63, Nipissing 73, and O'Brien 30 tons.

Considerable development work is going on in James township. Shipments are being prepared from the Gates claim and S. R. Cragg's location, where a smallite and silver vein 17 in. wide is being developed. A vein 8 in. wide rich in native silver has been found on the Downey property. A recent find on the Lucky Godfrey claim gives an assay of \$180 in silver per ton.—The Temiskaming & Northern Ontario Railway Commission has received a report from Arthur A. Cole, mining engineer to the Commission, indicating the opening up of an important new mineral area in the Temagami district. He reports having visited a mining claim five miles north of Temagami station and half a mile from the railroad, where the country rock is fractured Keewatin diabase, showing numerous quartz veins. In one of these, which was being worked for molybdenum, gold was accidentally discovered. The vein, two inches wide, was in one place rich with visible free gold. Copper was also found on another claim in the neighborhood, a fine specimen of which accompanied the report.

A large party of visiting English journalists has been touring through the mining areas of northern Ontario for ten days, accompanied by Mr. Frank Cochrane, Minister of Mines; they returned to Toronto on the 25th.

They were enthusiastic over the prospects of Ontario as a great mining country. The visitors were entertained at luncheon by Premier Whitney and the members of the Government.

Chihuahua, Mexico.

The Mines of the Santa Barbara District.—Tecolotes.—Montezuma Lead.—San Diego.—Hinds Consolidated.—Granadena.—San Francisco del Oro.—El Rayo.

The mines of the Santa Barbara district can, for convenience, be divided into four groups. In the town of Santa Barbara the principal mines are the Tecolotes y Anexas, owned by the American Smelters Securities Co.; the Montezuma Lead Co., owned by R. S. Towne and associates; the San Diego y Anexas, owned by the Torreon smelter interests; and the mines of the Hinds Consolidated Mining Co. In the Buena Vista district, which is about four miles north of Santa Barbara, are the Granadena, Merced, and Guadalupe mines owned by the Granadena Mining Co., the Igualdad mine, and others of smaller note. In the San Francisco del Oro district are the San Francisco del Oro mines, the Cuadras, Bronzes, and others of lesser note. At Los Azules, about 7 or 8 miles northwest of Santa Barbara, is the property of the El Rayo Mining & Development Co. With the exception of the last named all of these mines are working fissure-veins in limestone. The fissure-veins of the El Rayo mines are in trachyte.

The Tecolotes y Anexas mine is on a fissure-vein in the limestone, dipping west, and is 4 to 10 ft. wide. There are also two or three intersecting veins. The main vein is followed for a distance of about 2,000 ft., where it is sharply cut off by a large porphyry dike running in a general east and west direction. This main vein is opened up along its strike by four tunnels, and by a three-compartment shaft.

The ore is mined by overhand stoping, using Wah plug-drills. The miners stand on the broken ore, of which just enough is drawn out from the chutes at the main level to permit working room. The ore is drawn out of the mine in trains of 4 cars holding 5 tons each. These are hauled by an electric locomotive and dumped into a 1,000-ton bin. From the bin, the ore is hauled in rains of 5 cars of 6 tons capacity each by Shay locomotives.

The general milling scheme includes crushing with gyratory and Blake crushers and rolls to 6 mesh, followed by treatment on jigs, tables, and vanners. The middlings from the jigs and tables is crushed by rolls and Huntington mills, and re-treated on tables and vanners. The capacity of the mill is 450 tons per day.

A large 3,000-hp. gas generating-plant supplies power for the mill for compressing the air for the mine-drills, and for running the mine-locomotives and the electric hoisting engine at the shaft.

The Montezuma Lead Co. has a large property. At the present time very little is being done. When in operation, the ore was hoisted from three shafts and hauled to the mill, the capacity of which reached 300 tons daily. The general outline of milling was to crush with Blake crushers and rolls to 6 mesh followed by treatment on jigs, tables, and vanners. The jig middling was crushed and then sent to tables and vanners. A poor saving was made. A Wetherell electro-magnetic separator was installed for making a test on the zinc middling; this gave a fair extraction.

The San Diego Co. has shafts on several veins, one of which is at the mill, and from these shafts the ore is hoisted and hauled to the mill, which has a capacity of

60 to 75 tons per shift. The ore is crushed in Blake crushers and rolls to 6 mesh before treatment on jigs, tables, and vanners. The jig middling is re-crushed by rolls and re-treated on tables and vanners. The table middling is dried and run through an electro-magnetic separator to make a saleable product of the zinc-blende.

The principal mine of the Hinds Consolidated is the Clarines, which is developed to a depth of 220 ft. below the tunnel-level. Recently the Reforma mine has struck a body of sulphide ore of good grade and a drift is being pushed toward the Clarines, which is on the same vein. It is the intention to connect this drift with the fourth level of the Clarines.

The ore in the Clarines mine is mostly oxidized, containing lead, iron, copper, and zinc, and also some gold and silver.

A spur from the Mexican Central is being run to the Clarines to haul away the sorted ore and the concentrates to be made in the mill. Two 100-ton experimental mills are being built; in most respects they follow the general practice of the district.

The principal mine of the Granadefia Co. is the Granadefia itself, which is developed to a depth of 350 ft. The ore is a complex mixture of sulphides of lead, copper, iron, and zinc, carrying gold and silver. The average gold contents are higher than in any mine in the Santa Barbara district.

The Granadefia vein has a dip of about 70° west and has a general north-south strike. Its average width is three feet. Driving is done with machine-drills, and stoping by hand-work. The ore is removed both by overhand and underhand stoping and is hoisted to the surface through two shafts, where it is sorted and then hauled to the mill in mule-cars of about two tons capacity.

The milling practice is, in general, about the same as in the rest of the district, but the details are carried out in a more logical manner so that the efficiency of saving and commercial results are better than usual.

The ore is crushed in a Blake crusher and rolls to 12 mm. and treated on jigs, tables, and vanners. The jig middling is crushed twice through rolls and a Bryan mill and then re-treated on jigs, tables, vanners, and slime table, the object being to grade the crushing so as to reduce the quantity of slime to a minimum.

Water here is scarce, so an efficient settling system was designed. It was found that a zinc concentrate of 35 to 40% could be made by water concentration, which could be increased in grade and percentage of extraction by careful sizing of the 12 to 100 mesh material before treatment on the tables, vanners, and slime table. Eighty to 100 tons are treated per shift of 12 hours.

The San Francisco del Oro mines are probably the oldest in the district, being worked in the early days for the gold ore that was found at the surface. With increasing depth the ore turned to lead and zinc. An aerial tram was built to carry the ore to a point from which it could be conveniently loaded into wagons and hauled to San José, on the Parral & Durango railroad. At the present time a 50-ton experimental mill is being built; this is to employ Sutton-Steele tables and a flotation process.

The El Rayo mines are working on veins in trachyte, the ore from which is pyrite in quartz. About one-half of the gold is found in the pyrite. The ore is crushed to 60 mesh in a Blake crusher, rolls, and Huntington mills, and concentrated over vanners, where the pyrite with its gold content is recovered. The vanner tailing is classified, the sand being leached by cyanidation, and the slime agitated by mechanical stirrers with a cyanide solution. It is claimed that 90% extraction of the total gold in the ore is obtained.

Salt Lake, Utah.

Side-Line Agreement. — Shipments from Tintic. — Lucin District. — Consolidated Mercur Report. — Dividends in September. — Park City Mines Close Down. — Bingham Mining Affected by Copper Market. — A New Mill. — Railway to Pioche.

The ore shipments from the Tintic district last week amounted to 159 carloads, the contributing mines and respective amounts being: Ajax, 1; Beck Tunnel, 9; Bullion Beck, 4; Colorado, 10; Clift, 1; Centennial Eureka, 42; Carisa, 4; Depue, 1; Eagle & Blue Bell, 9; Eureka Hill, 5; Gemini, 5; Godiva, 2; Grand Central, 12; Lower Mammoth, 8; La Clede, 1; May Day, 10; Mammoth, 8; Scranton, 8; Shoebridge Bonanza, 1; Uncle Sam Con., 5; Victor Con., 1; Yankee Con., 5; Ridge & Valley, 2 carloads.

The Colorado, Crown Point, and Iron Blossom companies in the Tintic district have entered into an agreement to sink a joint shaft to be used in the development and operation of those mines. The boundaries between them are to be governed in the future by vertical lines. — The shaft of the Utah mine at Fish Springs has been re-timbered to the eighth or lowest level. This became necessary on account of the fire several months ago. — Much mining activity is reported from the Lucin copper district, in the western part of Box Elder county. The Copper Mountain mine, operated by the Salt Lake Copper Co., has 100 men employed and is shipping to the Salt Lake valley smelters. The property is controlled by the Lewisohn brothers of New York.

Dividends amounting to \$187,750 were paid by six Utah mining companies during September, the contributing properties and respective amounts being: Colorado, \$120,000; Lower Mammoth, \$14,750; Uncle Sam Consolidated, \$15,000; May Day, \$12,000; Grand Central, \$12,500; Daly West, \$108,000. The Silver King Coalition Mines Co. posted a quarterly dividend of \$187,500 and the Columbus Consolidated a quarterly dividend of 20 cents per share, or \$56,707 for payment in October. — The Daly West, Daly, and Ontario mines at Park City have been closed indefinitely on account of labor troubles. Because the management of the Daly West discharged a shift-boss who belonged to the miners' union and refused to reinstate him, a strike was called. About 500 men quit. While there has been no discrimination against union miners, the respective companies have employed non-union men as well, steadfastly refusing to recognize the miners' organization. — The Honerine mine at Stockton has been closed and the matter of resumption will come up for consideration at the annual meeting of shareholders on October 21.

The Bingham Consolidated Mining Co. has closed its Commercial mine indefinitely. The United States Mining Co. has ceased operations in the Old Telegraph mine and is only drawing on the galena mine for 125 tons of ore daily. These mines are productive of low-grade copper ores, which are not profitable to handle at the present time. The product can be handled advantageously, however, when absolutely needed as a flux for the silicious ore brought to the smelters from other districts. The Majestic Copper Co. has ceased production from its Old Hickory mine in Beaver county on account of the recent drop in the price of copper. The company has been shipping low-grade material to the Salt Lake smelters and derived a satisfactory profit when the market price of copper was above 20 cents per pound.

The New Stockton Mining Co., operating at Stockton, Tooele county, is installing new mill equipment, which will increase the capacity of the plant from 60 to 150 tons per day. The Stockton has shipped considerable high-grade lead ore during the present year, but the mine is

considered a low-grade proposition and will require a concentrating mill. The mine owners of the American Fork district are agitating the matter of better transportation facilities. An effort is being made to construct a railroad from American Fork to a point near the Wyoming mine in American Fork canyon. Fifty teams are engaged at the present time in hauling ore from the Wyoming property.

The Markham Gulch Milling Co. has completed a successful month's run on ore from the new Red Wing mine in Bingham. This property is opening up splendidly. Some important developments are looked for in the Utah Apex mine at Bingham. For some little time the management has been driving from the bottom of the 200-ft. winze from the Andy tunnel level, and the face is nearing the point where the orebody exposed in the upper workings should be encountered. Overhead the orebody showed a width of 12 to 15 ft. and shipments made from there have netted \$15 per ton. Utah Apex is producing copper at a cost of 6 to 8 cents per pound.

The citizens of Pioche, Nevada, are preparing to celebrate the arrival of the railroad in that camp. The Caliente & Pioche branch of the Salt Lake route is completed to a point within five miles of Pioche. It is expected that the road will be opened for traffic about November 1. The Western Pacific railroad will begin operating regular freight and passenger trains between Salt Lake City and Bews, Nevada, on October 1. The road will then be a competitor of the Harriman system on freight and passenger business to Ely and other points in eastern Nevada.

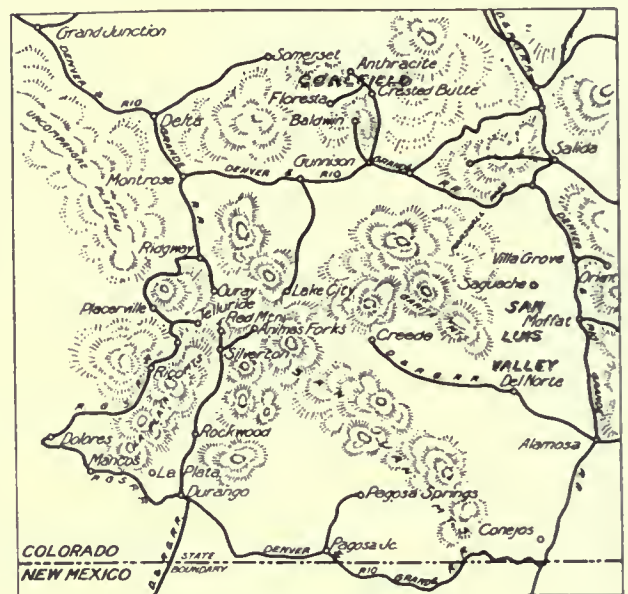
Denver, Colorado.

Cripple Creek Affairs.—The El Paso Case.—Western Federation.—Burns and His Antics.—Progress at Silverton.

Cripple Creek has been receiving a good deal of newspaper publicity lately. What with the disagreement within the directorate of the El Paso company, the revolt against the card system, the continuation of the Burns-Portland feud, and the discussion as to whether the Golden Cycle mill is to be rebuilt, the correspondents of the daily press have seldom been at a loss for material. The status of the El Paso case has been somewhat modified by the payment of the loan of \$15,000, which the El Paso company made to A. L. Burris some two years ago, and which seems to have been juggled with on the books of the company in a discouraging manner. Mr. Burris now flatly charges the president of the company with so manipulating its business affairs as to cause the stock quotations to fluctuate in a manner calculated to add to his personal gain, regardless of the interests of the stockholders, citing as examples the recent shut-down of company operations, and the delay in the work of driving the deep drainage adit, which he alleges was purposely caused to depress the stock to a figure at which the president could profitably buy back the shares he had previously disposed of at the top of the market. How nearly these charges are correct does not yet appear, but the general belief is that where there is so much smoke there must be some fire, and certainly the quotations of El Paso stock have been decidedly fluctuating. The card system disturbance seems to be the result of the virtual abandonment of that system in the San Juan, as a result of the serious labor shortage there, but which the Federation seems to think is due to its gain in influence. But Cripple Creek has an ample labor supply for the present, and the efforts of the Federation officials have so far met with a conspicuous lack of success. Feeling against the Federation is still far too strong in Cripple Creek for it to expect a recrudescence of

power there for a long time to come. In the Burns-Portland affair, Mr. Burns, disappointed in his efforts to secure a personal examination of the books of the company, has brought suit against the officials for \$1,000,000 damages, which he declares he has sustained by having the management of the company taken from him. This adds another specimen to the large and interesting collection of law-suits with which Mr. Burns whiles away his idle hours, finding that buying picture galleries, building libraries, or endowing colleges is far too tame an amusement for his strenuous nature. Probably his next suit will be for a billion dollars damages for the distress of mind to which he was subjected in being ousted from the control of the Portland, and thrust into outer darkness.

The Golden Cycle is at present treating the tailing dump of the old Telluride company in that portion of its mill that was not destroyed by the recent fire. The management continues to declare that the mill will be immediately rebuilt and that it is making contracts for ore at even lower treatment ratio than before, but the



Map of Southwestern Colorado.

speed at which reconstruction work is actually going forward seems hardly consistent with this, nor is the dismissal of a portion of the superintending and office force particularly reassuring. The other mills continue to work at full capacity.

One of the most flourishing parts of the San Juan is that tributary to Silverton, including Animas Forks and Gladstone. Numerous large mines and mills are in steady operation and the output has been strong throughout the summer, while development work has been correspondingly active. It is announced that the San Juan Smelting & Refining Co. will erect a 300-ton mill on Cement creek, just below Gladstone, near the Gold King and Mogul mills. The ore for the mill is to come from the Henrietta properties, and the production of that group should be considerably stimulated by the increased facilities. The Silverton district, like several others in Colorado, is somewhat burdened by the misguided zeal of optimistic individuals who proceed to drive adits thousands of feet into the face of nature, fatuously hoping to discover Golcondas and to eliminate the drainage problem from their plan of operations; but in spite of these, Silverton is 'making good.' The Ross smelter has shut down for the present, the low price of copper proving too much for a plant that has to rely on a purely local supply of ore. The properties owned by the Ross company have also been shut down temporarily, but the

custom ores, of which the smelter treated a steady tonnage, will simply be diverted to the Durango plant of the A. S. & R. company.

The Ohio & Colorado Smelting Co. has recently bought the control of a group of properties at Leadville, giving it a supply of ore that is more assured than a custom supply. One of the most conspicuous fakes in the State has also begun to operate in the Leadville district, and is proceeding to advertise its several million shares at a fraction of their par value, with the confident prediction that they will go to par by the end of the year.

Johannesburg, Transvaal.

The Guggenheims and Robinson. — Botha and the Cullinan Diamond. — The Work of Parliament. — Ignorance of Legislators. — Commissions of Inquiry. — The Problem of the Unemployed.

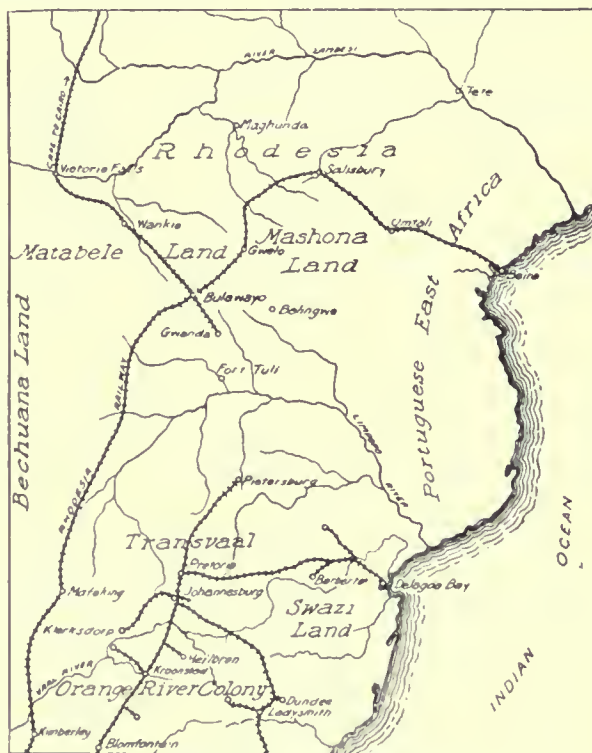
Much interest was excited by a newspaper report last week, that J. B. Robinson had induced the Guggenheims to put up £1,000,000 to open up some of his mines at Randfontein. Things must be rather bad in America if this report be true. A cautious man would think twice before he invested such a large sum on the Rand at the present time. The past record of the Randfontein district is not calculated to enthrall the would-be investor. So uncertain is the future, especially as regards labor, that American capital should be very careful in coming to the Rand. There are many safer outlets for any excess capital in the United States than the Randfontein mines.

The first parliament of the Transvaal is now over. The session closed at Pretoria last week. The last days were rendered very lively by the discussion on the proposal made by Premier Botha to donate the celebrated Cullinan diamond to King Edward, as a diadem in his crown from the people of the Transvaal. The Opposition were placed in an awkward position. Never before has there been so much distress in the country as exists today. To levy more taxation on the people at the present time to pay for a present to the King, is inopportune to say the least. Sir George Farrar, the leader of the Opposition, objected to the proposal in a dignified speech, declaring that His Majesty would rather see a prosperous colony than receive the greatest diamond in the world. The Government was obdurate, however, and the proposal to present the Cullinan diamond to King Edward was carried by a large majority.

A great amount of work has been rushed through Parliament this session. In reviewing the work one is forced to admit that the policy of the Government seems to be to use the mines for the benefit of the agricultural interests. The attitude of the Government has not been sympathetic to the mines, and if they continue as they have commenced, they will succeed in "killing the goose that lays the golden egg." Probably ignorance is responsible for most of the mistakes of the Government. There is not a single business or technical man in the ministry. They are farmers and lawyers. Their acquaintance with the mining industry is not much better than the man in the street, who has the extraordinary notion that the mining industry can carry any load that is thrust upon it. The ministry does not seem to realize that mining is a business, which can be killed by unsympathetic legislation, just as any other enterprise can be ruined.

Apparently the Government wants to run the country by commissions. These commissions are somewhat of a farce, and appear to be a waste of time. A commission appointed to report on the question of a patent law for the Transvaal handed in its report a short time ago. The Government paid not the slightest attention to the re-

commendations of the commission, and fixed up the patent law to suit itself, despite the protests of all the technical societies of the Rand. There is another commission sitting in Johannesburg now, the Mining Industry Commission, christened in derision the 'Creswell Commission.' Mr. Creswell was formerly manager of the Village Main Reef mine; he it was that advocated the use of more white labor on the mines. He proved to everyone's satisfaction, save his own, the impossibility of his scheme. Now that he has the power, he is 'rubbing it in' to the present management of the mine, demanding data which do not concern the commission at all. The inquiry seems to have degenerated into an attempt on the part of Mr. Creswell to prove his position. The only hope is that if he is given sufficient rope he will hang himself, for the more figures that are published, the more will it be shown how much superior the present scheme of running the mine is to his method. And Mr. Creswell appears to be



Transvaal and Surrounding Country.

the chief technical advisor to the Government. This explains a lot!

The thousands of unemployed men and women are clamoring to be repatriated, as there is no work for them to do, and they must live on charity or starve. Last week the Premier wrote to one of the Unemployed Committee stating that it will be unnecessary for any white man to leave this country, and saying that every effort must be made to increase the white population rather than diminish it. It is to be hoped that the Government can do something for the unemployed, but the outlook is not bright.

Your correspondent has been in this country nearly twelve years, but he never remembers seeing such a state of affairs as is witnessed in Johannesburg today. Go down any of the streets, and a man will come up and say, "Excuse me, Sir, but don't you remember we worked on the same mine some years ago? Well, I've been trying to get work for weeks past, and have not succeeded. I'm down to my last shilling, and would like you to help me!" You give the money with a heavy heart, not that you mind parting with a pound or two, but with deep regret that in this new country white men should find it necessary to beg in the public streets.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

POROUS SANDSTONES afford channels for water, and many tiny cavities that may be filled with precipitated minerals; hence they are often selected for ore-deposition in preference to adjoining strata.

SULPHATE ROASTING evolves a large amount of heat, and should easily proceed automatically, without extra fuel, if the physical conditions favoring the sulphate roasting are properly understood.

THE wetted perimeter of the cross-section of a channel is that part of its boundary that is in contact with the water. The hydraulic radius of a water cross-section is its area divided by its wetted perimeter.

IN hydraulics, the terms energy and head are often used as equivalent, although as a matter of fact energy is proportional to head, and lost head is not a loss of pressure-head alone, but also of velocity-head.

WATER is more compressible than iron, or than timber within the elastic limit. The amount of compression is directly proportional to the applied pressure, and water is perfectly elastic, recovering its original form on the removal of pressure.

A WATER-TURBINE is a wheel in which the water enters around the entire circumference, instead of at one point, so that all the moving vanes are simultaneously acted upon by the dynamic pressure of the water, as it changes its direction and velocity.

ASPHALTUM is reported as occurring at several places in the island of Cuba, and exploitation of the material has expanded greatly during recent years. The reports indicate that more than three-fourths of the asphaltum exported from Cuba is sent to the United States.

SAFETY LAMPS are designed to give light in gaseous workings without the danger of igniting the gases present. The principle of the lamp depends on the cooling effect that an iron wire gauze exerts on the flame, decreasing the heat below the ignition temperature.

TYPE-METAL consists of lead, tin, and antimony, or of only lead and antimony, but may contain a little copper or nickel. The antimony generally varies from 17 to 20%. Britannia-metal and white-metal consist principally of antimony and tin, with some lead, copper, zinc, bismuth, and nickel.

ONE of the first attempts at gold dredging in California was made in July, 1894, on the American river at Natoma. It was a grab dredger run by steam power and had a capacity of 500 tons per 24 hours, with two 10-in. pumps. The scow was 18 ft. wide and 30 ft. long. Three men were employed.

JOINTS are planes of fracture running through rocks, few rocks being without them. Fragments of broken rocks are often more or less completely bounded by plane surfaces, whether the rock is stratified or igneous. In stratified rocks, one or two of these plane surfaces are apt to be due to the bedding; the others are joints. In igneous rocks, all the planes are usually joints.

A RIVER VALLEY often shows along its sides shelves, terraces, or benches, part of the old river bottom when

the stream was at a higher level, before it cut for itself a newer and deeper channel. If the rock in the region is gold-bearing, and if there is gold on the bars and in the valley gravels of the present streams, then gold may be looked for in the gravels lying in these higher benches.

THE gypsum that is imported into the United States comes, except a few hundred tons annually from France and the United Kingdom, almost wholly from Nova Scotia and New Brunswick, and enters the ports of the New England and northern Atlantic States, over one-half entering the port of New York. The gypsum imported is nearly all calcined and converted into wall plaster. A small quantity is used as land plaster, and some is mixed in patent fertilizers.

THOUGH the facts that diamond-drills have a tendency to deviate from the vertical has long been well known to Rand engineers, the custom of surveying bore-holes did not arise till a few years ago. The result of the surveys has been to show that the deviation may be most serious, and the results obtained have to be viewed in a new light, not only in reference to the position of the reef where intersected, but also in regard to the width of the reef as shown by the core.

NEARLY all the refining of metals is based upon the fact that some, or all, of the accompanying impurities oxidize more readily than the metal which is under treatment. These oxides, being lighter than the metal, rise to the surface if they are not soluble in the metal itself, and may be skimmed off as a slag. This refinery slag also often contains a large amount of the oxide of the metal itself, and must be smelted again to recover this valuable metal.

IN copper smelting, it is not desired to obtain metallic iron, but to utilize the iron contents of the ore to form ferrous oxide, which will combine with the silica and produce an easily melted slag. Thus the furnaces are comparatively low, use a small proportion of coke, and the charge is so proportioned as to fuse at a moderate heat and form a readily fusible slag that will run out rapidly, the column of ore sinking through the smelting zone before the temperature is high enough, or the reducing action of the gases powerful enough to convert the iron oxides into metallic iron.

THE principal deposits of bauxite in the United States have been found in Georgia, Alabama, and Arkansas. During 1906 bauxite was discovered in Tennessee, Virginia, and Pennsylvania, far north of the deposits previously known. It is noteworthy, however, that although these new discoveries extend the area known to contain bauxite, the general location, relations, and character of the deposits fulfill the conditions described by Survey geologists a decade ago—that is, the bauxite is invariably associated with Cambrian or Cambro-Ordovician rocks, such as Knox or Shenandoah limestone of the valley regions, and in association with faults.

WHEN applied to materials used in the construction of furnaces, fusibility is a comparative term. In fire-brick there are various degrees of fusibility, and in certain portions of a reverberatory furnace, such as the arch, bridge, and side-walls, the most infusible fire-brick that can be secured is none too refractory. For such places, the silica, or dinas brick is employed. This consists principally of silica, mixed with just enough refractory binding material to hold the grains together. As the joints are the weak spot in the brickwork, the mortar for silica brick should be made of the same materials as the brick itself.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

Plumbing a Deep Shaft.

The Editor:

Sir—In your issue of August 25, 1906, there is a brief but very clear and interesting article by Mr. W. E. Downs on a quick method for a vertical shaft survey. The method described has features that commend it in cases where hurry work has to be done and in others where the degree of precision required is not too high. Should there occur an opportunity to check the azimuths in the survey described by means of a plumb-line in another shaft, other engineers will without doubt be glad to learn what degree of precision was attained. It will, of course, be quickly recognized that with so short a base line as 2.43 ft. slight changes in relative position of the wires mean relatively large variations in azimuth. Probably most engineers will agree that had it been possible to hang the wires further apart and set the transit up well outside their plane more accurate results might be expected with little, if any, sacrifice of speed in performing the observational work, since the process of 'jiggling in' would have thus been avoided.

The soft drawn wire has some obvious advantages as pointed out, but it may be questioned whether a No. 24 piano wire with 60-lb. bobs such as I have seen used is not sufficiently superior to the No. 12, B. & S., soft iron wire with 125-lb. bobs to compensate for the somewhat greater care necessary in reeling to avoid troublesome kinks.

The offhand explanation of the downward divergence of the wires as due to gravity and entirely independent of falling water and air circulation must be taken with considerable caution. In this connection it seems remarkable that there exists even among engineers and other trained persons such a general lack of appreciation of the forces of gravitation except in the single instance of the forces between the earth and objects upon it. It is true that the bobs are separated somewhat by gravitation, as Mr. Downs states, but the amount of such deflection is greatly over-estimated. Dimensions, which are not given, would be needed to compute it, but judging from results obtained in my investigation at the Tamarack mine*, it is scarcely possible that it exceeded one two-thousandth of a foot, that is, one fortieth of the divergence observed. Probably it was much less than this.

A much more likely cause of the divergence might be found in the magnetic conditions about the wires. No account of these is given, but it is easy to imagine the presence of a large air-pipe and possibly steam-pipes. Each length of these is a strong magnet with north pole at the lower end. Where lengths are joined, especially if it is by means of flanged junction, such pipes create a strong horizontal field, and, since the effect of such a magnet is roughly inversely as the square of the distance, it is not difficult to see how it might produce both divergence and, what is worse, deflection affecting the azimuth. Further, any horizontal polarity might be disposed so as to add its effect, though with torsional vibration the effect could not be constant, while longitudinal polarity in the bobs, if in the same sense in each bob as it might quite easily be, could alone produce all the observed divergence. There is also a very small repulsive force between the extremities of the wires themselves independent of their surrounding and due to the fact that, like

the pipes, they are in the earth's magnetic field and are magnetized with lower extremities as north poles. The amount of this force is too small to be significant in the case described.

The statement that "drafts and falling water do not have any effect on the sum total of this divergence," depends for its accuracy altogether on the local conditions. With a shaft as deep as a thousand feet and with openings of a considerable size tributary thereto, it is more than likely that air currents may be responsible for divergence, convergence, or abnormal azimuth. That the diverted position of one or both wires may be of remarkable steadiness was convincingly shown in the observations on the long lines in the Tamarack shafts above referred to. Water, also, if entering more from one side than the other, might have a total effect in some horizontal direction. Indeed, it might be fairly questioned whether in a 2,000-ft. shaft with a good deal of water the easterly deviation of a falling body might not appear as a factor in the deflection of a plumb-line from its normal position. Whatever may affect the position of the wires, it is obviously only the difference of the effect on the two which appears in convergence, divergence, or changed azimuth.

The engineer confronted with the problem of plumbing a deep shaft has considerable difficulties to overcome if it is necessary to do precise work, and he should study very carefully the surroundings with reference to the magnetic conditions, the circulation of air and the falling of water in order to decide on what is the best procedure to follow, and to judge correctly the precision of his results.

F. W. MCNAIR.

Houghton, September 21.

Speculation or Investment?

The Editor:

Sir—I note with considerable interest an article in your paper of the 21st inst., under the head of editorial, regarding the removal of two dredges from Colorado to California. The article ends with the statement that "mining is, was, and will be to the end of time a sane speculation or a silly gamble, but never an 'investment.' The element of risk is never eliminated, and any statement to that effect, as regards a particular mine, is made by the charlatan or the fool." Don't you think this is a rather broad statement, and why should mining be eliminated from the category of judicious investment? Take for an example a carefully developed mine, with a certain tonnage absolutely blocked out, and in sight. Carefully conducted milling, and money in hand as result of same, show the value of the ore to be such as place it far beyond the danger line. Is this in your opinion a speculation, or what side of the fence are you on?

An engineer might carry enough up his sleeve to eliminate any risk, and still call it an investment. How about the Independence? I can understand your statement coming from an investor, but hardly from an engineer, or the editor of a mining paper.

F. E. WILLSON.

Boise, Idaho, September 25.

[Mr. Willson's objection is reasonable. Like most discussions, this one ought to have been prefaced by a few definitions. Mr. Willson and the Editor are probably in agreement as to their ideas, but not in regard to the terms employed. An 'investment' differs from a 'speculation' in that the element of risk is eliminated, thus United States bonds and British consols are typical investments, so are the bonds of railroad companies that are well managed and have weathered the financial

* See *Electrical World* for April 26, 1902.

crises of times of depression, such as the Pennsylvania, New York Central, and the like. The test of an investment is easily made. If you are willing to lock it up in a safe for, say, five years, it means that the fluctuation in the principal is subordinate to the interest receivable and that you are holding it merely as a source of income. In the case of a mining share the question of interest is quite subordinated to that of an enhancement in the principal; you would be unwilling to lock up your stock in a safe for any length of time, knowing that it is liable to fluctuations so great as to make its income-bearing feature unimportant as compared to differences in the quotation. A mine may double in value within a week; an established railroad is not subject to violent fluctuation in capital worth and even the changes that do occur are not likely to affect the earning power of the bonds, the interest on which is fixed at a maximum, while in the case of a mine the dividends obtainable are unlimited. For this reason most people prefer mining stock paying 10, 15, or 20% to a bond paying $3\frac{1}{2}$ to 4%. Despite the risk, the greater returns make the mine share more attractive than the railroad bond. Of course, railroad shares are speculative; owing to the games of big gamblers such shares are just as risky as mining stocks, without the possibilities that make mining so attractive. Replying to Mr. Willson; even a well developed mine, with ore in sight, a good mill, etc., is not an investment, but it is an excellent speculation. A fire in the mine or mill, litigation, labor strikes, dishonest management, an error in the estimates, a refractory change in the ore, increased cost of operation due to water, and so forth, are among the dangers to which the best mine is subject. On which side of the fence are we? On the side of fact. As to the Independence, that was a good speculation, which was made a poor gamble by absurd mismanagement of its affairs. The editor of a mining paper is in control of a publication devoted to the application of science to industry; in consequence, he has to deal with facts, incidentally combating popular error and make-believe—and all in the best interest of mining. To regard mines as good speculations instead of fixed investments will not hurt business; to get alongside of facts will promote honesty.—Editor.]

Searching Questions.

The Editor:

Sir—It often happens that young engineers are called upon to make an examination of mining properties before they have had any experience in work of this kind. Of course, there must be a first time for every engineer. Assuming that he is competent to make the examination and deliver the report, there are a good many minor questions regarding the etiquette of the transaction, the answers to which are not in the books; the only standard the young man has by which to gauge his procedure, is what the seasoned engineers can tell him, and the scattered and scanty information on this subject that is in print. Therefore, in behalf of the younger generation, I would like to ask the following questions, all of which are simple, many of which may seem unimportant, but most of which are of interest to the man who has had but little experience in examination work. If we could get answers to some of the questions from several men, we might deduce a series of useful rules. The objection will probably be raised that the questions are too ambiguous to be answered intelligently, as each individual case introduces diversified conditions. But it is impossible to arrange a more detailed set of questions in a compact form, so they must be treated in a general way. Assuming that the examination will consume from one to three

months, and entails the necessity of a rather long journey on land and water, the man for instance starting from Colorado, bound for the tropics, and that the amount involved is about \$100,000, then;

1. Is it better to charge a fee, or undertake the work on a salary basis?

2. Is it advisable to have a written contract with your employers, properly drawn up and signed, or is the letter or telegram engaging you for the job sufficient?

3. Can a lump sum be demanded in advance to cover all the expenses of the trip?

4. Can the company properly be charged with all of the equipment necessary for the work, outside of the personal necessities of the engineer?

5. About traveling expenses. (a) Are tips to servants, laundry bills, tobacco, ammunition, medicines, etc., legitimate expense items? (b) Is the engineer entitled to the best first-class passage on train and on shipboard, and to the best accommodations at hotels? (c) If the young man be of an economical turn of mind, is it right for him to travel second-class, or even steerage, and charge the company first-class, he pocketing the difference? (d) How minutely must the details of the expense account be kept? Are frequent charges of 'incidentals,' to cover small expenses, permissible? (e) Is it best to take vouchers for large expenditures? If so, over what amounts? (f) Can expenses incurred in entertaining men while getting pertinent information from them, be entered on the account? (g) If the expedition consumes say three months, should the statement of expenses and cash balance be rendered weekly, monthly, or at the end of the engagement?

6. If you are sure of your fee, is it a good plan to send periodical reports on the progress of your investigation, giving results, such as assays, as they are obtained in the course of the work, or is it better to withhold all this information until your final report? Is the company justified in demanding frequent periodical reports of this kind?

7. If your examination indicates to you that the shares should be worth more than they are selling for on the open market, is it fair to buy these shares, before your report is turned in? Is it all right to do so afterward? In other words, is it permissible to use information gained at company expense, for private gain, during or subsequent to your term of employment?

8. Is it legitimate to take advantage of your presence in a district, to examine, and perhaps option mining properties for yourself, provided your employers are not in the field to purchase new ground, and no time is lost that properly belongs to the company?

9. Should there be any objection to publishing, in technical periodicals, a description of the district visited, giving general information of the conditions obtaining there, the topographical and geological features, and conclusions concerning the possibilities of successful mining, provided, of course, your employers will suffer no direct injury thereby?

10. Is it always expected of the engineer to say 'yes' or 'no' to the property? Even though the property is comparatively undeveloped, or badly opened, and the facts obtainable are insufficient for an intelligent opinion, must the engineer always reach a definite conclusion? If the mine is an old one, badly caved, is the engineer justified in spending company money to clear out old drifts, unwater shafts, and open caved ground, and may this work be properly charged in his expense account, without definite authority for such work from his employers?

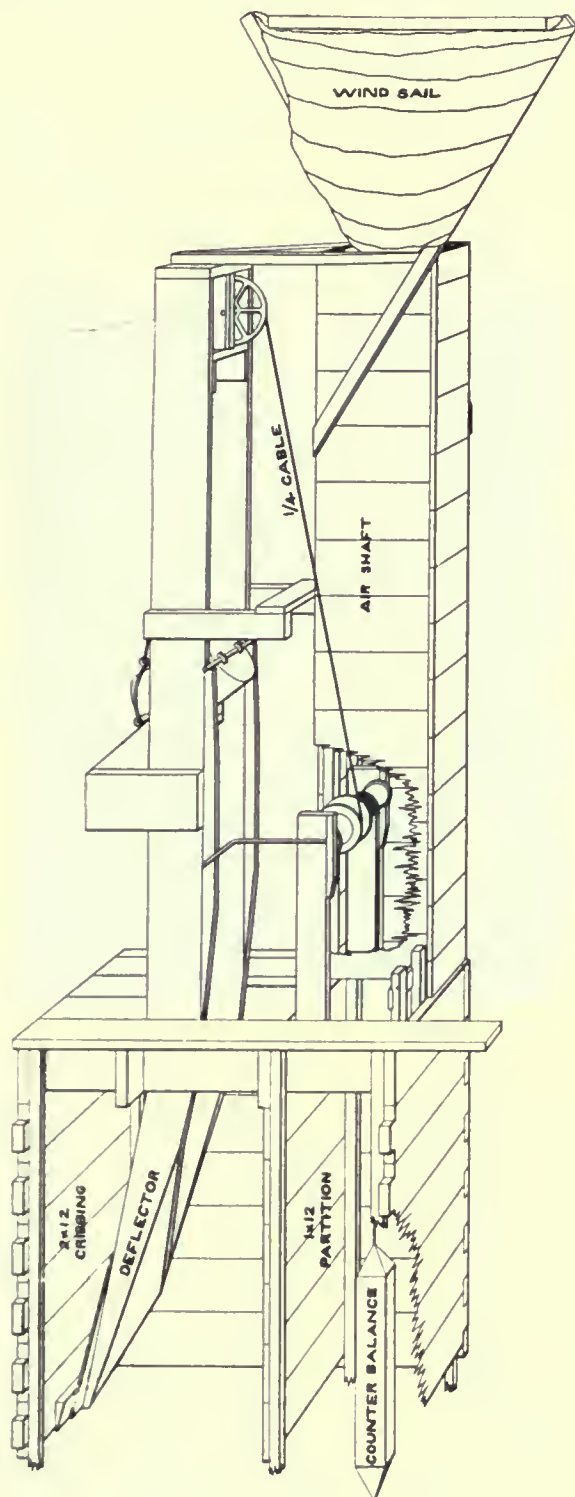
T. S.

San Francisco, September 18.

A Handy Windlass.

Written for the MINING AND SCIENTIFIC PRESS
By F. S. BECKETT.

The accompanying drawing is of a windlass rigged up by the writer at the West Goldyke mine, at Goldyke, in Nevada. With the help of this windlass, a 100-ft. shaft has been sunk and a 290-ft. cross-cut run quickly and economically. About 180 lb. of rock is raised on each



A Handy Windlass.

trip, besides the weight of bucket and rope, but by employing a counterbalance and a self-dumping arrangement, one man does the windlassing with no more effort than two men usually put forth with the ordinary arrangement.

The counterbalance is weighted so that it requires nearly as much effort to raise it and lower the empty bucket as to raise the full bucket and lower the counter-

balance. That portion of the drum where the counterbalance rope binds is smaller than where the bucket rope winds. The counterbalance thus moves slower than the bucket, and never reaches the bottom of the shaft, to be in the way of those working there. This portion of the drum is also tapered so that as the counterbalance falls and the unwinding rope adds to the suspended weight, the radius of the drum decreases. Thus the pull on the handle of the windlass due to the counterbalance remains uniform, being independent of the position of the weight hanging in the shaft.

In dumping the bucket, the windlass man's hands do not leave the handle. The operation is as follows: As the bucket approaches the collar of the shaft, the bar on the bottom of the bucket strikes the V-shaped deflector, and the bucket is turned so that the two ends of the bar slide along the two vertical guides until they fall into place on top of the guides ready for the bucket to be dumped. The bucket now tips slightly forward, being pulled into that position by the rope. When the motion of the handle is reversed, it gradually tips and dumps the rock in the chute and car. Should a heavy piece on one side of the bucket overcome the tendency to tip forward and compel it to tip backward, the handle is reversed until the bucket leans against the 2 by 6-in. guard, when a smart forward turn throws it forward with sufficient force to overcome the tendency to tip backward. After the load is dumped, the handle is turned forward, and just before the bucket reaches a vertical position another extra push on the handle throws the bar off the top of the guides, freeing the bucket for its trip downward.

The shaft is cribbed as shown with 2 by 12-in. plank, with a 1 by 2-in. partition, which has proved heavy enough for the ground. About one-half of the manway is carried up 12 ft., and on top of this a simple wind-sail is placed. With this arrangement the ventilation has always been good, and even at the breast of the cross-cut a lighted candle shows considerable movement of air.

Anyone who can handle rough carpenter tools can easily put up such a windlass, and timber the shaft, out of 1 by 12-in. and 2 by 12-in. board. The sheave can also be home-made in the form of a wooden roller.

IRON ORE FROM THE LAKE SUPERIOR REGION.—The greater portion of the iron ore mined in the United States is obtained from the territory tributary to Lake Superior, and thence taking its name of Lake Superior region, which has produced an enormous amount of iron ore. The bulk of this ore is forwarded from shipping ports on Lake Superior and Lake Michigan by vessel to the docks at the lower lake ports on Lake Erie, from which it is sent by rail to blast-furnaces in Pennsylvania, Ohio, West Virginia, Virginia, etc.—in one case of temporary need being transported as far as Colorado—and to receiving ports at Chicago, Milwaukee, etc. There are five shipping ports on Lake Superior: Duluth and Two Harbors in Minnesota; Superior and Ashland in Wisconsin; and Marquette in Michigan; while two ports, Escanaba and Gladstone, are on Lake Michigan, both being in the State of Michigan. Duluth, Minn., generally leads as a shipping port, followed by Two Harbors, Escanaba, Superior, Ashland, and Marquette. The iron ore obtained from the Mesabi and Vermilion ranges in Minnesota is shipped by way of Two Harbors, Duluth, and Superior. From the Gogebie range in Michigan and Wisconsin the ore goes to Ashland; from the Marquette range in Michigan by way of Marquette and Escanaba; and the Menominee range ores from Michigan and Wisconsin are shipped from Escanaba, some of the Gogebie ore also reaching the latter port.

Gold Measures of Tangier, Nova Scotia.

Written for the MINING AND SCIENTIFIC PRESS
By GEORGE A. PACKARD.

To one who is for the first time called upon to examine a district where the mines have been worked entirely by small owners, or by lessees, it is surprising how large an amount of work may be done with little definite information obtainable as to the mode of ore occurrence. Such a surprise was mine when in September, 1905, I first visited Tangier, in Nova Scotia. It was in this district that gold was first discovered in the Province in 1860, and some idea of the amount of work that had been done here may be obtained from the fact that on a single property, covering 230 acres, 114 shafts had been sunk on 20 veins. A false impression might be conveyed by the last statement, for the deepest of these shafts reached only 200 ft., the average for the 114 being 67 ft. One reason for this condition is found in the fact that when gold was discovered, the Government divided the surface into very small claims, and allowed but one claim to each individual. As a result, a single vein shows 17 shafts within a distance of 800 ft., while a parallel vein 40 ft. distant has 10 shafts.

Most of the gold mines of Nova Scotia are located upon veins that correspond in dip and strike with the forma-

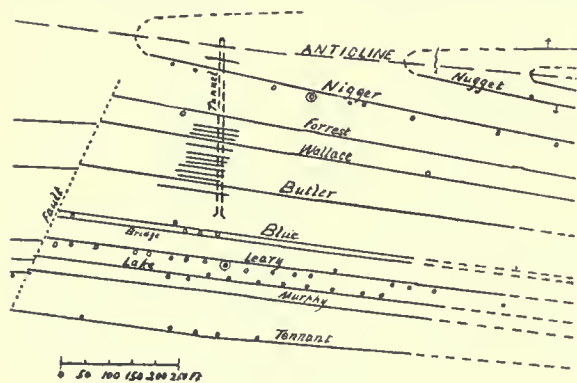


Fig. 1. Plan of Veins.

tion. This is made up of sedimentaries which have been strongly compressed in a northerly and southerly direction. The resulting anticlinal folds have been eroded, leaving the outcrops of the veins apparently forming, at Tangier, a series of much elongated ellipses. Little work has been done here on the north leg of the anticline, but the indication is that the angle of dip is the same on both sides, and accordingly the fold has a vertical axis. The sedimentaries consist of slate and more or less metamorphosed sandstone, locally termed 'whin.' The veins occur in the slate, often near, or at the contact with the whin. As far as I have had an opportunity to observe them, these slate 'belts' are not over seven feet wide. The quartz veins vary from a fraction of an inch to eight feet in width. They are made up of white quartz, with up to 2% of sulphides, and a varying, though considerable, quantity of included slate derived from the walls. The sulphides are pyrite, pyrrhotite, chalcopyrite, arsenopyrite, and galena. The district differs from some others in Nova Scotia, in that here the proportion of arsenical sulphides is very small.

Altogether, in a distance of two miles and a half, east and west along the anticline, 30 veins have been worked, none of them lying further than 800 ft. south of the anticlinal axis. One only is to the north of this axis and has the dip to the north. Prior to 1905 the manner of mining had apparently been to sink a shaft to a depth of 25 to 50 ft. and then start breaking the ore at the bottom, working from the shaft on both sides. No level was driven, in the common sense of the term, though the

bottom slice, carried from 12 to 18 ft. high, was kept a short distance ahead of the one above, with stulls at the usual height, thus ultimately forming a level to which the ore was dropped through chutes carried up as stoping continued. No pillars were left to protect the shafts, but, aside from the broken timbers and rubbish which has fallen in from the surface, many of them are still open after 30 years. This gives some idea of how well the ground stands. This condition is favored by the facts that the workings are shallow, none over 200 ft. deep, while in many cases the veins are narrow, and the broken slate is left underground.

In 1905 I found acres of ground covered with piles of slate, but practically no quartz to be seen, all of this having been milled. Mr. E. R. Faribault of the Dominion Geological Survey had prepared an excellent map of the district, showing the position of the croppings of the veins as far as he had followed them, so that aided by this and guided by some old miners, I was able to trace

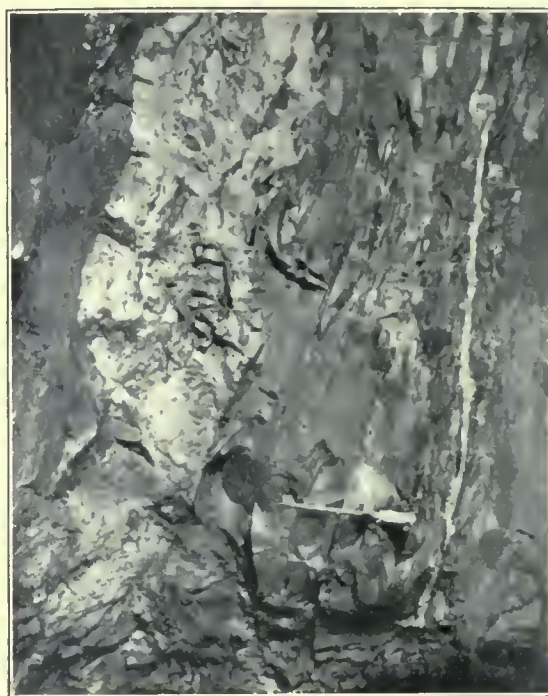


Fig. 2. Face of 200-Ft. Level on the Leary Vein.

the veins among the piles of slate. The records of the Provisional Government at Halifax showed that the district had produced, and paid taxes on 23,921 oz. of gold from 50,542 tons crushed up to that time, an average of \$9 per ton. With all this work there were no records showing how, or where, the pay-ore occurred. Some of the veins had been mined almost continuously along the surface for several hundred feet, indicating long pay-shoots. Others had been opened only at intervals of 200 ft. or more. The accompanying plan shows the outcrop of the veins and the small circles indicate where shafts have been sunk. See Fig. 1.

A recent visit to the property shows some interesting results. Development has been undertaken on three different veins. Of these the Leary lies farthest from the anticlinal axis and has the steepest dip, about 70°. Fig. 2 shows this vein as it appears in the face of the 200-ft. level west. On the right is seen the contact of the quartzite foot-wall with the slate 'belt' or bed in which the quartz occurs. This bed is here 42 in. wide. The quartz vein is from 6 to 12 in. wide and consists of a series of pinches and swells, the latter averaging about four feet apart vertically. There is more chalcopyrite here than in the ore from the other veins, while the gold occurs in

finer particles, being ordinarily caught quite as much on the plates as in the mortar when milling with a 20-mesh screen. In rich shoots, however, large nuggets are said to have occurred. The ore from this vein is easily distinguished by the angular appearance of the included slate. The 'belt' is hard, with quartz stringers through it. The main body of the quartz adheres firmly to the hanging and may be taken down by itself after the slate has been stoped.

Fig. 3 shows the Nigger vein, looking east at a depth of about 60 ft. This vein lies 360 ft. north of the Leary, and, according to Mr. Faribault's map, is at this point only 65 ft. south of the anticlinal axis. The dip is about 58° . The belt of slate and quartz is about the same width as the Leary, but is softer, and the quartz and slate come down together. The best ore occurs in the 'rolls' in the vein, one of which is shown in the photograph. The next one is about 12 ft. above this. They

in this, from 8 to 12 in. wide, above which is 12 to 16 in. of quartz with included slate, partly covered in the photograph by the man's arm. Above this is another narrow slate band on the hanging. The width of the whole 'belt' between the 'whin' walls is six feet. The gold occurs here both in the comparatively clean quartz, and in that above, containing slate. It is so coarse that, in a mill-run where 87 tons crushed through 20 mesh showed 80 oz. of gold, 97% failed to pass the screen and was cleaned up from the mortars. During the period of ore deposition some of the pieces of gold had ample room to choose their own form, for crystals are common, one noticed being over a fourth of an inch across. Another piece of ore shows an eighth-inch gold wire in the midst of an inch mass of pyrrhotite, with plates of gold in the white quartz near by. On the pyrrhotite is a coating of chalcopyrite.

The development on this vein showed a feature not



Fig. 3. A Roll in the Nigger Vein.

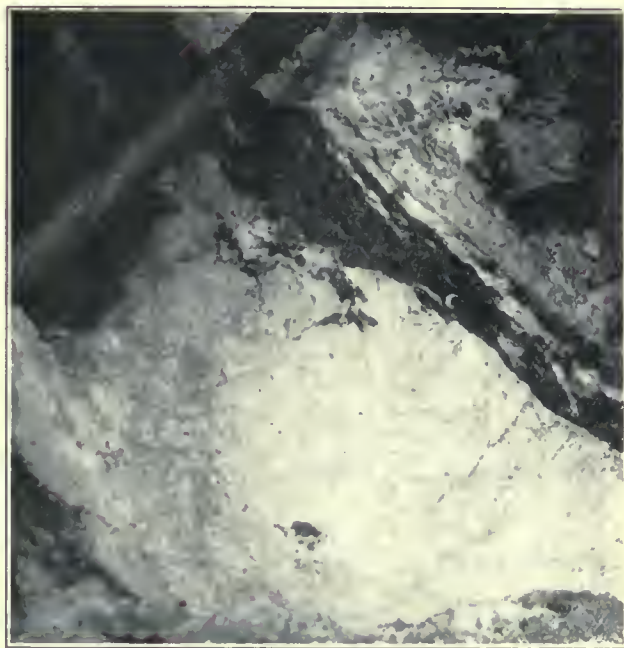


Fig. 4. Face of Nugget Vein on 240-Ft. Level.

have a slight downward trend, possibly 15° , toward the west. The quartz varies from 24 in. wide at the rolls to 10 in. between them. It differs from that at the Leary in that the slate is not often included in angular shapes, but occurs so as to give the vein a banded appearance. This photograph is especially interesting because of the wedge-shaped quartz and included slate at the 'roll,' as if the quartz had actually been bent when in a plastic condition, and the cracks, diverging from the centre, had been filled with slate, after which the whole was cemented with more silica. Nuggets weighing up to one ounce are of frequent occurrence in this roll while they are rare in the narrow portion of the vein.

Fig. 4 shows the face of the 240-ft. level looking east on the Nugget vein. This vein lies 95 ft. north of the Nigger, but as this shaft is about 1,400 ft. east of the work on the Leary and Nigger already referred to, and the veins diverge from the anticlinal axis in going east, the Nugget vein is at this point about 80 ft. south of the dome of the anticline, according to the map of Mr. Faribault. The dip of the vein is about 60° south. As indicated in the photograph, the ore is quite different in appearance from that in the Leary and Nigger. The vein, which in the inaccessible level 90 ft. above is said to have been 22 in. wide, has here widened to five feet, the larger portion being white quartz. There is one band of slate

observed on any of the other veins accessible. In following the slate and quartz from the surface the quartz entirely disappeared at a depth of 127 ft., and from this point, excepting for a few stringers, the belt appears as an ordinary stratum of slate. However, the pay-shoot was encountered at the point expected, about 17 ft. east of the shaft on the 240-ft. level, and has continued for over 100 ft. toward the east. The pay-shoots on this vein are supposed to trend westerly at an angle of about 45° , but this is not proved.

Why veins so close together, and formed simultaneously, should exhibit such varying characteristics, is a problem for the geologist. It should be said that Mr. Faribault considers the "dome of the anticline," from which there is a slight dip both easterly and westerly in addition to the steep dip northerly and southerly, to be situated at a point about north of the shaft on the Kent. It may be that this condition had some influence on the vein formation, resulting in the frequent small swells in the more distant Leary, the more pronounced 'rolls' of the nearer Nigger, and the broad shoot of the Nugget close to the dome. It would seem, with the multitude of shafts on this property, that there should be some record as to the occurrence of rolls on veins in the vicinity of the Nigger, or of wide shoots on veins near the Nugget.

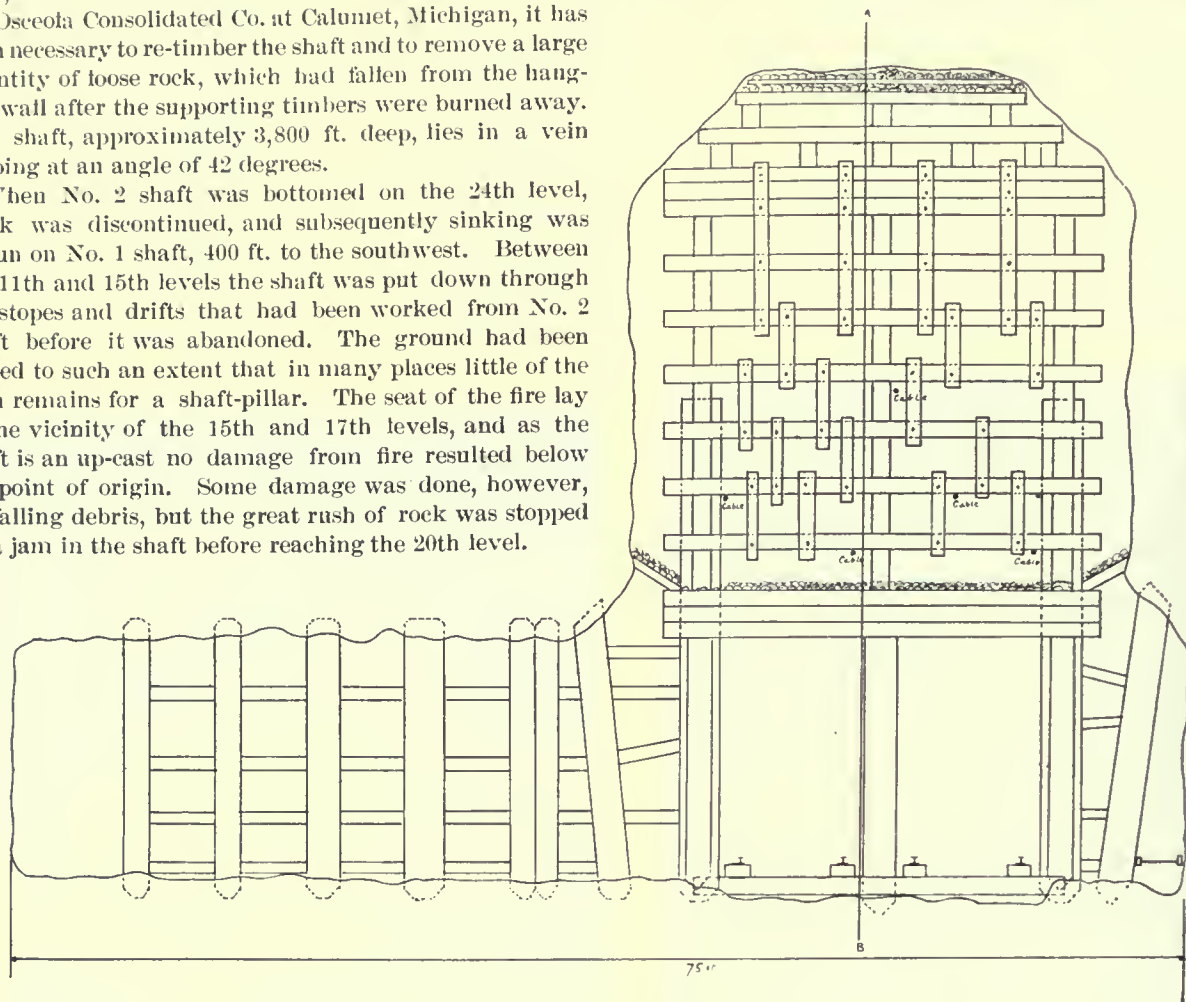
Re-timbering the Kearsarge Shaft.

Written for the MINING AND SCIENTIFIC PRESS
By LEE FRASER.

As a result of the fire during the month of September, 1906, in No. 1 shaft of the North Kearsarge branch of the Osceola Consolidated Co. at Calumet, Michigan, it has been necessary to re-timber the shaft and to remove a large quantity of loose rock, which had fallen from the hanging wall after the supporting timbers were burned away. The shaft, approximately 3,800 ft. deep, lies in a vein dipping at an angle of 42 degrees.

When No. 2 shaft was bottomed on the 24th level, work was discontinued, and subsequently sinking was begun on No. 1 shaft, 400 ft. to the southwest. Between the 11th and 15th levels the shaft was put down through the stopes and drifts that had been worked from No. 2 shaft before it was abandoned. The ground had been stoped to such an extent that in many places little of the vein remains for a shaft-pillar. The seat of the fire lay in the vicinity of the 15th and 17th levels, and as the shaft is an up-cast no damage from fire resulted below the point of origin. Some damage was done, however, by falling debris, but the great rush of rock was stopped by a jam in the shaft before reaching the 20th level.

ally falling from the hanging wall in large pieces, making it necessary to use every precaution against fatal accidents to the timbermen; both walls were unstable, and no foothold could be obtained for the timbers; the hanging wall was so high that it was impossible to support it with single stulls and impracticable to use spliced stulls.

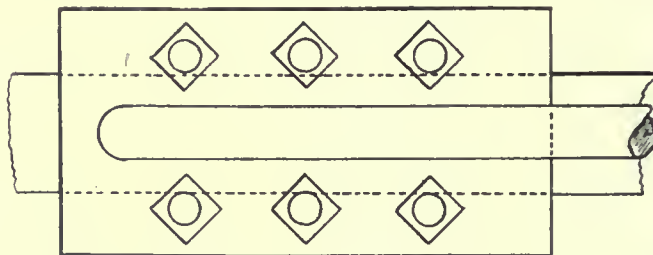
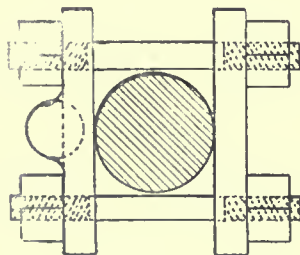


Cross-Section of Shaft.

Running diagonally across the shaft in the vicinity of the 12th level are heavy seams of calcite and lanmontite, and under the action of the intense heat of the burning timbers the rock broke away from the hanging wall along the line of these seams to such an extent that in places the distance between the foot and hanging measures as much as 50 ft. The hanging slopes away to its

Minor difficulties entered into the solution of the problem so as to make it appear almost impossible.

Above the cave, where the height of the shaft is normal (15 ft.) heavy stull-pieces were firmly wedged between foot and hanging and four 12 by 12 in. timbers were set together between the two skip-roads. A substantial temporary foundation was thus formed from



Details of Cable Attachment.

maximum height in a distance of about 200 ft., while on the south side of the shaft for almost the entire distance between the 11th and 15th levels open stopes extend into the vein for a distance of 100 ft. The north side of the shaft, however, is sustained by pillars.

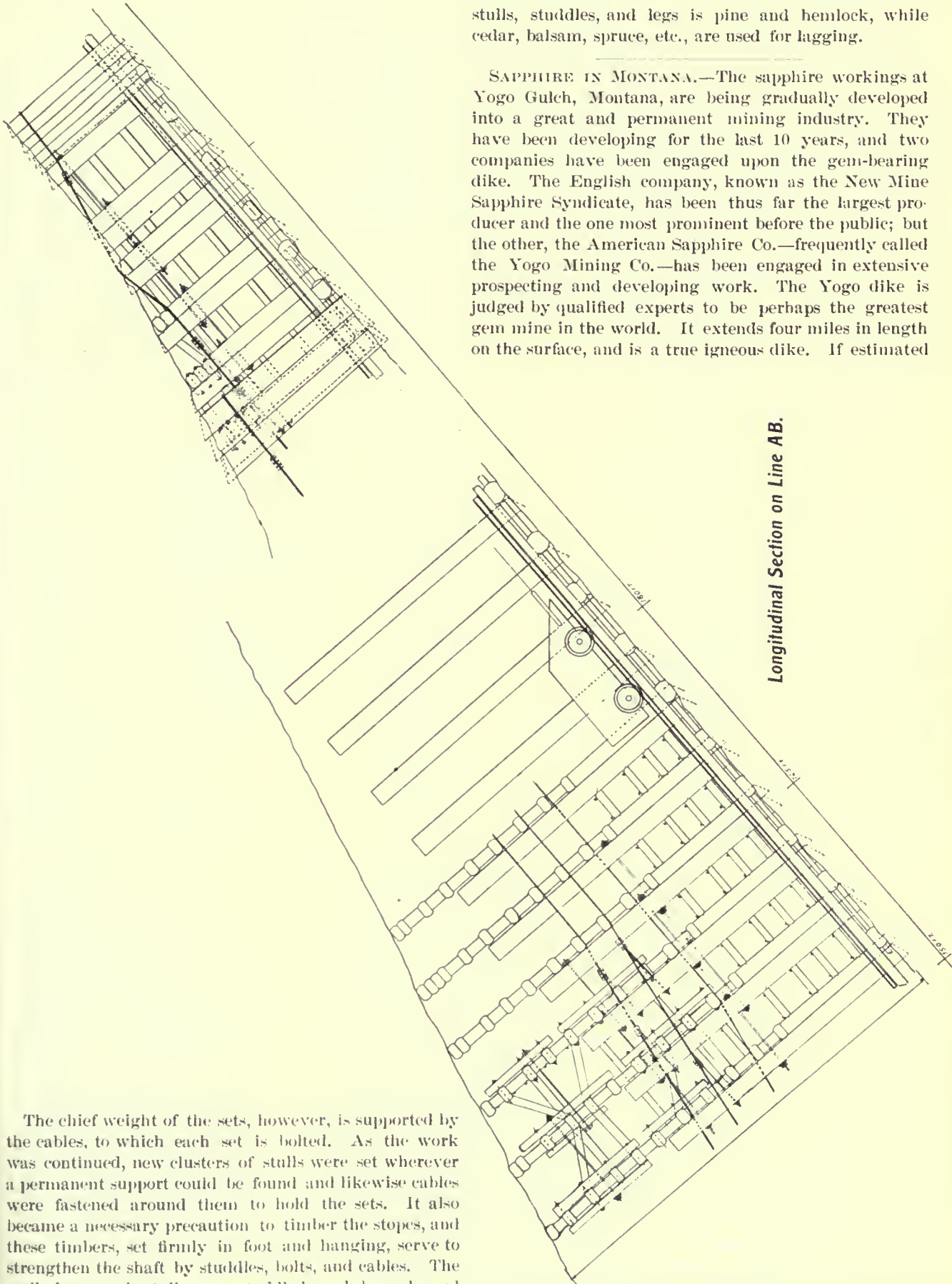
The dangers and difficulties in re-timbering the shaft were many: It was choked with loose dirt; there were half-burned timbers and masses of rock 20 to 30 ft. long and from 10 to 20 ft. thick; loose rock was continu-

ously falling from the hanging wall in large pieces, making it necessary to use every precaution against fatal accidents to the timbermen; both walls were unstable, and no foothold could be obtained for the timbers; the hanging wall was so high that it was impossible to support it with single stulls and impracticable to use spliced stulls. Above the cave, where the height of the shaft is normal (15 ft.) heavy stull-pieces were firmly wedged between foot and hanging and four 12 by 12 in. timbers were set together between the two skip-roads. A substantial temporary foundation was thus formed from

wedged into the foot-wall and spiked to the stulls. Short studdles are then set on the caps, supporting in turn another wall-plate, until the set has been built up to the required height.

skip-roads to support the centre of the wall-plates. This will relieve the strain on the cables, for as the cables gradually stretch and give the weight will be delivered to the studdles, making the structure strong and permanent. The timber used in the construction for the stulls, studdles, and legs is pine and hemlock, while cedar, balsam, spruce, etc., are used for lagging.

SAPPHIRE IN MONTANA.—The sapphire workings at Yogo Gulch, Montana, are being gradually developed into a great and permanent mining industry. They have been developing for the last 10 years, and two companies have been engaged upon the gem-bearing dike. The English company, known as the New Mine Sapphire Syndicate, has been thus far the largest producer and the one most prominent before the public; but the other, the American Sapphire Co.—frequently called the Yogo Mining Co.—has been engaged in extensive prospecting and developing work. The Yogo dike is judged by qualified experts to be perhaps the greatest gem mine in the world. It extends four miles in length on the surface, and is a true igneous dike. If estimated



The chief weight of the sets, however, is supported by the cables, to which each set is bolted. As the work was continued, new clusters of stulls were set wherever a permanent support could be found and likewise cables were fastened around them to hold the sets. It also became a necessary precaution to timber the stopes, and these timbers, set firmly in foot and hanging, serve to strengthen the shaft by studdles, bolts, and cables. The wall-plates and stulls are studded and braced, and spiked and bolted securely, while each set is bolted and studded to the next following, and the whole framework double-lagged. As soon as the permanent foundation for the superstructure has been placed each set will be cross-studded again, and timbers placed between the

down to 2,000 ft., below which possible working becomes questionable, and at an average width of only six feet—although it is often much wider—the entire content of sapphire-bearing rock would approximate 10,000,000 cubic yards.

Progress on the Rand.

In his presidential address before the Chemical, Metallurgical and Mining Society of South Africa, Mr. John Yates said:

To speak of the past is easy, but attempts to outline the future are often seen in the after light of developments to be merely caricatures. But so far as metallurgy is concerned, I think I may safely say that its development has in most cases exceeded expectations, that what was in past years hoped of it has been very often surpassed by actual accomplishments, and it may be that this pleasing trait will be maintained in the future. I have often thought that we would do well to thoroughly reconsider our impressions and practices every few years. Our practice at any time is based upon the particular conditions existent at that period, and, as the conditions change, so should our methods if we are to reap the full benefit of economic and other developments. Metallurgy especially has been advancing so rapidly of recent years, and working conditions in the Transvaal exhibit such a betterment compared with pre-war days that we cannot be too watchful of events or too critical in our inspection of our own work; propositions which would have been absurd in the old days may now, owing to the changes which have occurred, be feasible and payable schemes.

I shall not be at all surprised to see a few years hence, economic conditions permitting, 800 stamps or more under one roof on these fields. Such a mill need not necessarily be attached to one mine; for instance, three large adjoining deep level properties, each of 400 stamp capacity, and each independent so far as shareholders' interests are concerned, might advisedly have a joint 1,200 stamp-mill with suitable workshops, power station, and staff; this is what the unrivaled expanse of our gold beds calls for, and this operating on a large scale, a scale commensurate with that of the deposit, is what will have to be done if we have to work these reefs of ours to the depths they should be worked. We want larger properties, great joint mills, and a cheapening of our surface installations and our working costs. Turning now to detail, the use of the rotary sand distributor at work on the Langlaagte Deep is being attended with an improvement in extraction and we may expect to see it thoroughly tested. It is improbable, I think, that any further cyanide plants of the superposed type will be erected; the plants of the future are more likely to have only a few catching tanks, but a liberal number of treatment tanks, all more or less on one level, transference of the sand being effected by conveyor belts. When considering mechanical appliances, like the Blaisdell excavator, we have to bear in mind the cheapness, compared with most other mining fields, of our unskilled labor, and though the machine mentioned works well, I doubt that it can be installed in every case with advantage. Our tube-mills are doing good work and have proved a friend to the shareholders by increasing our profits. Our stamps are, as I have already mentioned, taking on more weight year after year and I am inclined to predict that we will see one ton gravitation stamps and even larger. Compared with the giant steam stamps of the Lake Superior copper mines with their capacity of 300 to 500 tons per stamp per 24 hours our stamps are but toys, and while I fully appreciate the difference in the quality of the product in the two cases I cannot help asking our metallurgists and engineers whether, under the conditions at present obtaining on the Rand, steam stamps are not at least worthy of consideration; I merely put this as a question, you will observe. True progress is often hampered by conservatism on the one hand and ill advised attempts to advance on the other; it is for us to try and avoid both of

these and I think it unfortunate that the continuous slime process has proved unsatisfactory on the New Goch because the failure may deter our engineers and financiers from venturing on any new lines unless absolute safety is assured, and this is often very difficult to guarantee in advance. The idea of all-slimes is in abeyance for the present, but with cheaper power and supplies we may expect a recrudescence of arguments in its favor; the new Usher-Adair process which has, I understand, passed trial runs satisfactorily will, it is to be hoped, cut down the present capital charge for slime tanks somewhat.

Concentration by Frue vanners on the Rand is about to become a thing of the past, the Langlaagte Estate having decided to discard them and fall into line with our general practice. The Wilfley table is still at work on the East Rand Proprietary mines and it remains to be seen whether its undoubted superiority to the vanner will enable it to hold its own. The treatment of residue dumps *in situ* has not been sufficiently successful to induce more than a very few mines to try it.

Relative to our mill construction the next few years will probably see timber battery posts superseded by steel, as the increasing weight of our stamps is likely to turn the scale against fear of trouble arising from crystallization of the metal.

Steel collar sets for our shafts are likely to become popular because of their great permanency compared with timber and the innovation at Kleinfontein in the way of steel sets throughout will be watched with interest. Our shafts are increasing in sectional area as we go south to the deeper zones and the irresistible demand for less capital outlay and for maximum profits will, of course, result in their number, relative to a unit area, being reduced to a minimum. The deeper we go the more costly will our development become because, among other things, of the increasing heat and the longer time occupied in getting to and from ends, etc., and for these and other reasons I foresee the laying out of our deeper levels with longer backs in conjunction with mechanical transport of the ore in the stopes. On hand versus machine stoping our experience on these fields has demonstrated, in my opinion, that we should use hand drilling in stopes under 5 ft. wide, and 2½ in. and larger drills in stopes over this size, and my own experience with 'baby' drills was such as quite convinced me personally that there was little scope for them on the Rand.

On this field we have been more than once accused of indifference to labor-saving devices, but, as a matter of fact, there is little in the shape of labor savers that we have not tried, some have successfully stood the test of practical application and have been adopted, others have failed ignominiously when put to the trial and have therefore been cast aside, and I believe that out of deference to public opinion, and with a whole-hearted desire to economize labor to the full, our engineers and managers are responsible for our having labor-saving devices at work at the present day which it would benefit us to relegate to the scrap heap. And after all, as has already been pointed out, these mechanical contrivances touch our labor army very slightly, and we must remember that both white and colored are affected and that labor savers do not necessarily mean a higher ratio of white to colored labor, nor yet increased profits.

ASPHALTUM IN VENEZUELA.—The production of asphaltum from Bermudez lake in Venezuela, which fell off greatly during 1902 and 1903 on account of litigation between the two American companies claiming the right to work the deposits, attained unusual proportions after the settlement of the legal complications.

The Combination Mine.—II.

Methods of Mining.

Written for the MINING AND SCIENTIFIC PRESS
By EDGAR A. COLLINS.

Owing to the irregular shape of the orebodies, and their relatively great width, the problem of timbering the stopes merited a good deal of study. Good stulls are expensive and hard to get, anything over eight or nine feet having to be brought from the eastern slope of the Sierra, a distance of 200 miles. For this reason a stull 18 or 20 ft. long and 7 in. diam. at the small end will cost about \$5. Similarly, short heavy round lagging is obtainable from the piñon pine on Montezuma mountain, about six miles distant, at a cost of 50c. apiece. Conse-

tial chutes were placed at every fourth set of timbers, being thus spaced with 20-ft. centres. At first it was thought that it might be necessary to carry the stope in floors and to place a line of stulls every 20 ft. or so in height, to steady the walls, and to act as a break in case difficulty was experienced in drawing the ore from the stope. It was found, however, that the ground stood so well, and so little difficulty was experienced at the chutes, that the idea of the floors was abandoned, and the block of ground was carried as one continuous stope. As has been already remarked, the orebody had no definite walls, and the limit of the ore was simply the point at which the silicified material was too low-grade to pay. This limit varied in an extraordinary manner and it was found necessary to watch the work closely.

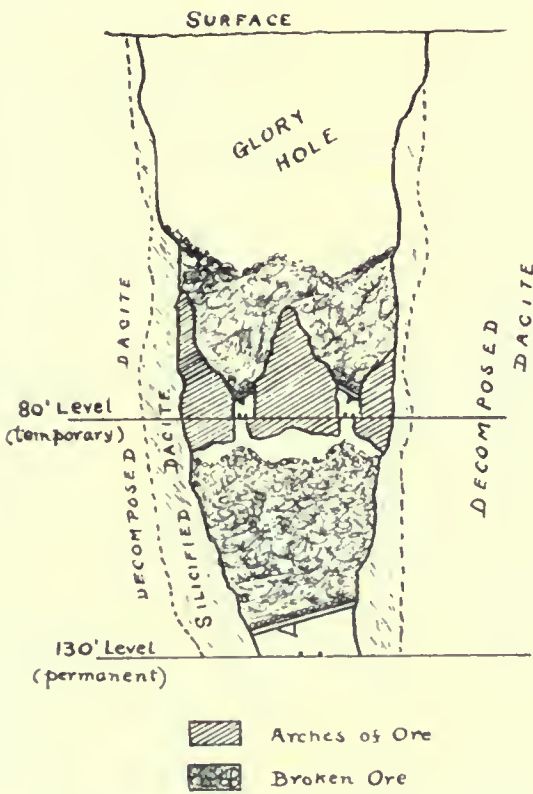


Fig. 1. Method of Stopping 'Old Shaft' Ore-Shoot.

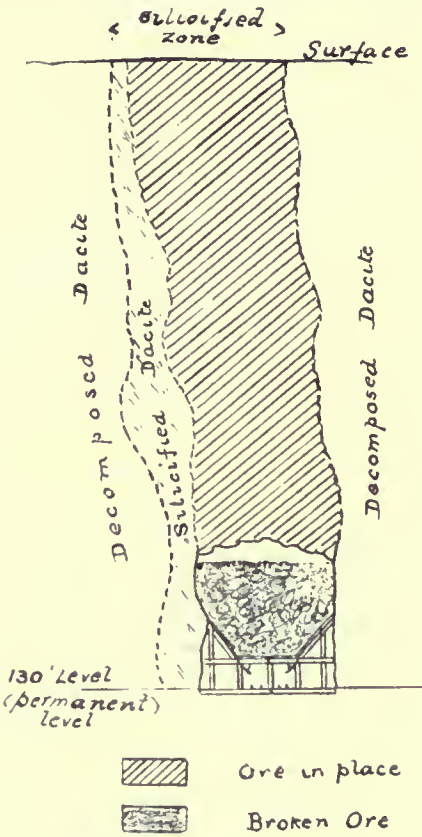


Fig. 2. Method of Stopping No. 3 East Stope.

quently, sawn lumber is used to a great extent in the mines. This is of poor quality and costs \$45 to \$50 per thousand, depending on the stock that the local yards are able to carry. In the upper levels of the Combination mine, where the ore is oxidized and the silicification especially pronounced, the ground is ideally easy to support. The silicified material is all wedged together and a minimum of timbers is necessary. It was therefore decided to stull and lag the cutting-out stopes over the level, and to fill with broken ore, as the stope progressed. As a further economy it was decided to timber permanently only alternate levels, and to leave arches on the intermediate levels that could be stoped out from the lower of each pair of levels. The following method was therefore established. At the first or 80-ft. level, after the drift was driven to the end of the ore-shoot, hitches were cut and short stulls were set in place, with the usual short head-boards. These were covered with lagging and a second stope commenced. At the same time the stope was widened on an incline above the timbers until the full width of the orebody was reached. The broken ore was allowed to remain in the stope, sufficient only being drawn off to allow room for the men to work. Substan-

As it was absolutely impossible to tell pay-ore from worthless vein-stuff by its appearance, recourse was had to continual panning, the gold being sufficiently free to act as a fairly reliable guide. Samples were therefore taken from every working face each morning, and panned by the mine foreman, who then made out a short report, which was turned in at the office. To further keep in touch with the ore, flat holes were drilled 6 ft. apart and 1 ft. deep, at intervals of 12 ft. in height, on both walls of the stope. The drillings were saved in two parts, those from the first two feet, and those from the second two feet, and were assayed as separate samples. If the results showed ore, the holes were blasted and the operation repeated; otherwise, the holes were left unblasted. As the stope progressed, the ore was found to extend farther and farther into the sides or walls of the stope, and eventually the stope was over 50 ft. wide at one end. By working the stope in sections, and by keeping the 'back' arched, no difficulty was encountered, nor was there a man hurt while the block of ground was being removed. Finally, a hole was made through the last 15 ft. or so to the surface, and the remainder of the arch of ground removed by underhand stoping. On the second or permanent level (130-ft. depth) the

whole of the pay-ore was taken out to the full width, and the level then timbered with either square sets or stulls, according to the width of the orebody. A second stope was then commenced, and continued, exactly in the same way as the first stope until within six feet of the level above (1st level). Raises were then put through the remaining arch to the level under each chute, after which tramming on the upper level was abandoned. The broken ore remaining above the upper level was run down into the lower stope until the arches over the level were reached. The arches were then stoped out as fast as they were exposed by drawing the broken ore, and at the same time any ore still remaining on the sides of the stope was removed. At the present time, March, 1907, the lower stope is full of broken ore and open quarrying is still going on around the sides. The 'glory hole' left is about 120 ft. long and will average about 30 ft. wide. After all the ore has been drawn out of both upper and lower stopes, it is proposed to fill the excavation above the 130-ft. level with waste from surface. This will be obtained partly from the present dump, and partly from future 'dead work.' It might be of interest to remark that the old incline shaft passed through the centre of both the first and second level stopes, and thus afforded excellent ventilation. A narrow stope on one of the high-grade seams of ore had also been taken for a short distance from the old incline shaft, through the middle of the block of ground. These 'old workings' caused us some little trouble when the big stope was commenced, and care was required to avoid 'caves,' but practically no timbering was necessary.

The above program of stoping was planned for the sulphide as well as the oxidized ore, down to the 230-ft. level, with the difference that in the stopes in sulphide ore, where the silicification was not so strong, and the ground therefore weaker, permanent timbers were placed at each level (50 ft. apart), and chutes were placed with centres only 15 ft. apart. It was planned to fill these stopes with waste from other parts of the mine, after the broken ore had been withdrawn. Below the 230-ft. level, the vein flattens in dip to about 38° and a different method of stoping would have to be employed. No definite plan had been decided on, but it is probable that it will be necessary to lower the ore on inclined movable tracks, laid on the foot-wall of the stopes, as is being done elsewhere, notably on the Rand in South Africa.

The Combination mine has 14 shafts and 7,100 ft. of levels. Only two of the shafts have ever been used for hoisting. The others are mainly prospecting shafts that were sunk to establish the position of the lode. Of the two working shafts, No. 1 was the original incline shaft, which constituted the main opening for the first two years of the mine's existence. It was sunk on the rich stringer that was exposed in the shallow 'tunnel' previously mentioned, and followed it from surface to the 230-ft. level. For the first 80 ft., the vein dipped slightly to the southwest. The next 50 ft. showed the streak almost vertical. From a depth of 130 ft. to 210 ft. the average dip was about 70° to the northeast. At the 210-ft. point the vein flattened to about 38° and the average dip between the 230 and 280-ft. levels is about 35°, also to the northeast. At the 280-ft. level, which is the lowest point at which the vein is exposed, the dip is about 30 to 35°. Below this level the lode has not yet been exposed. In June, 1905, a main vertical hoisting-shaft was started. The shaft, which was 9 by 5 ft. inside timbers, was divided into a hoisting-compartment of 4 ft. 8 in. by 4 ft., and a manway of 4 ft. 8 in. by 2 ft. 10 in. Between these a narrow compartment, 8 in. wide, and the full width of the shaft in length (4 ft.

8 in.), was divided into a box for the counterweight, and compartments for pipe and electric wires.

This shaft was sunk for the first 20 ft. only, the balance of the distance being raised from cross-cuts driven from the main levels of the mine. A small irregular shaped raise about 3 by 5 ft. was carried up from each level, and after connection was made, a chute was put in and the shaft trimmed to full size. In this way the shaft was sunk cheaply and expeditiously during the delay in arrival of the electric hoist, all broken rock being hoisted through the old shaft. The average cost of sinking this shaft to the 230-ft. level, including breaking, raising, mucking, timbering, and all supplies, was \$22 per foot. The cost of the timber alone amounted to \$9 per foot. From the 230-ft. level to the present bottom (400 ft.) the shaft was sunk by day work. Practically no water was encountered. The total cost per foot, exclusive of hoisting but including timber and all supplies and labor was \$23.12 per foot.

As a general rule development work in the lower levels was cheaper than in the oxidized zone. This was due to the less degree of silicification. Cross-cutting beyond the limits of the silicification is extremely cheap, the rock on the lowest level being much decomposed. For this reason it was not considered economical to use machine-drills in the development work. For the same reason the use of the diamond-drill for prospecting the adjoining country, as used in the mines of Tonopah, was not favored. The average cost per foot for driving, raising, sinking, and cross-cutting at the Combination, including breaking, supplies, track-laying, and timbering, where necessary, is as follows:

Average cost per foot driving and cross-cutting	\$5.50 to \$6.00
" " " " raising on lode	6.00 to 6.50
" " " " sinking winzes on lode	8.00
" " " " sinking prospecting shafts (practically no timber, and in soft rock down to 120 ft.)....	7.50 to 8.00
Cost of sinking main shaft, 9 by 5 ft. inside timbers, 400 ft. deep, including all labor and supplies, but no hoisting charges.....	23.12 per foot
The cost of the timber alone.....	6.50 per foot

There are four separate ore-shoots in the Combination mine. These are known respectively as the Old Shaft, No. 2 East, No. 4 West, and January shoots. The Old Shaft shoot has up to the present produced the bulk of the tonnage already treated. It is seen as the 'Glory Hole' on surface, and has been opened up on the 80-ft., 130-ft., and 180-ft. levels. On the 80-ft. level it is roughly 100 ft. long by 20 ft. wide, and is pretty thoroughly oxidized. On the 130-ft. level it is only about 75 ft. long by about 30 ft. wide, while the ore contains a larger percentage of sulphides. On the 180-ft. level, the ore-shoot is about 50 ft. long and 35 ft. wide where cross-cut. Here the general outline of the shoot appears to be triangular. Below this level the ore-shoot has not been found, and it may possibly be cut off, by the flatter-dipping No. 4 ore-shoot, to be described later.

The No. 2 East shoot is the longest continuous ore-shoot in the mine (about 320 ft.), and certainly one of the longest, if not the longest, in the district. For convenience it has been divided into two parts. The longer and more southerly portion, which follows the east, or hanging wall, side of the silicified zone, is known as the No. 2 East stope. This averages only three or four feet wide of pay-ore, bounded on the east side by a thin shell of almost barren silicified material, adjoining the soft bluish country rock, and on the west side by the main mass of the low-grade silicified zone. There is no defined line between ore and waste. The more northerly portion of this shoot extends into the silicified material for (as previously described) an average width of 20 ft. and a length of about 150 ft. This is known as No. 3 East stope. At the present time the whole shoot is exposed

only on the 130-ft. level, where it is fairly well oxidized. On the 180-ft. level No. 3 East shoot has just been found and the ore is still well oxidized. It has not yet been cut on the 230-ft. level. The No. 2 East stope portion of this shoot has not yet been found on the 180-ft. level, but has been opened up on the 230-ft. level, for a distance of about 70 ft. At this point it is partially oxidized and of lower grade, but payable. Below this level the ore-shoot has not yet been found.

The No. 4 West shoot lies immediately west of the Old Shaft shoot, and parallel to it. It occurs in the same silicified mass, and is only separated by about 30 ft. of barren lode matter. It has been opened up on the 80-ft., 130-ft., and 180-ft. levels, and it is probable that the main ore-shoot, as exposed on the 230-ft. and 280-ft. levels, is a continuation of this shoot of ore, as it shows the same well defined flat dip to the northeast. On the

on the 130-ft. level, some 300 ft. northwest of the Old Shaft shoot, on what is known as the January lode. This is the northeast extension of the horseshoe-shaped zone of silicification that enters the west side line of the Combination claim, about 350 ft. north of the main shaft. This ore-shoot occurs in the oxidized and silicified material, and is about 100 ft. long by about the width of the drift (5 ft.) The shoot in all probability extends practically to surface, a distance of about 100 ft., as the adjoining ground in the January mine has been stoped right up to the line, from this level to surface. A winze has been sunk some 47 ft. in ore, but otherwise the ore-shoot has not been developed below the 130-ft. level.

The following detailed mining costs, covering operations at the Combination mine during the year 1906, should prove interesting to those who may be contemplating the operation of mines in the district, and should

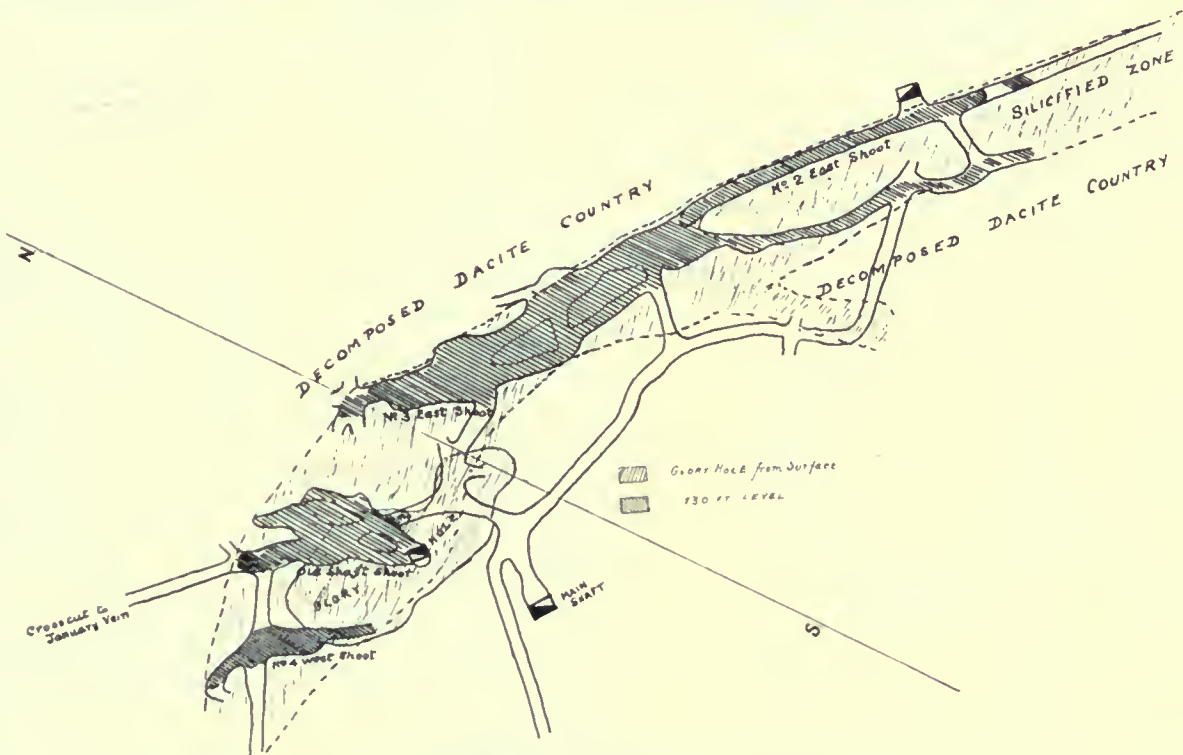


Fig. 3. Showing Ore Shoots on the 130-Ft. Level.

80-ft. level the ore-shoot is a lens of high-grade oxidized ore, about 60 ft. long, and about 15 ft. at the widest. On the 130-ft. level it is a little longer and better defined, but averages lower in grade. On the 180-ft. level, the orebody is entirely sulphide in character, and averages a higher grade, and has a length of about 100 ft. At the eastern end the lens narrows to a thin wedge, which is overlapped by a second longer ore-shoot. It is this second shoot that produced the large tonnage of high-grade sulphide ore shipped from the mine. It is a curious fact that this "all-sulphide" ore-shoot does not extend up to the 130-ft. level, although high-grade ore was stoped to within two feet of the track. On the 130-ft. level, the pay-streak is represented by a narrow clay 'gouge.' On the 230-ft. level the ore-shoot is about 225 ft. long, of which some 75 ft. was exceedingly high-grade. On the 280-ft. level the ore-shoot has been followed for a length of 100 ft. Below this level the vein has not yet been proved, but a cross-cut has been driven at the 380-ft. level to intercept the vein. At the time that I left the mine (March 1, 1907) this cross-cut had been driven a distance of 350 ft., and it was expected that the vein would be cut near the 400-ft. point. This was estimated on the supposition that the vein would continue with a dip of about 30° to the northeast.

The fourth shoot of ore, known as the January, occurs

give a good idea of the comparative expense of the various items shown:

Mining Costs per Ton During Year 1906.			
Foreman and shift-bosses...	\$0.199	Assaying	\$0.162
Shaft sinking	0.305	Surveying.....	0.057
Driving and cross-cutting..	0.940	Tracking and ditching ..	0.038
Raising	0.0165	Tools.....	0.045
Stinking winzes.....	0.029	Watchmen.....	0.118
Surface trenching.....	0.008	Maintenance, repairs.....	0.056
Stoping	0.913	Pumping.....	0.017
Hoisting and dumping.....	0.439	General.....	0.002
Tramming and mucking...	0.365	Total.....	3.709
Mining.....	\$2.41		
Development.....	1.30		
Total.....	\$3.71 per ton.	Of this 82¢ is for labor alone.	

It will be noticed that in spite of the high price of labor—probably the highest paid in the world—and the heavy cost of all supplies, especially timbers, the expense of breaking ore and hoisting it to surface is not unusually high, even including development charges. The explanation of this is the fact that the ground at the Combination mine is full of soft shattered seams, which both drill and break exceptionally well, while the method of stoping employed requires comparatively little timber. Prospecting, outside the limits of the silicified lode, is cheap, because the rock is soft and decomposed. It must also be remembered that the mine is practically dry at its present depth, and the cost of pumping is therefore insignificant.

The mill has been described in detail on several occasions, particularly by Mr. F. L. Bosqui, the consulting metallurgical engineer for the company, and it is therefore unnecessary for me to mention it further than to repeat that it is a 20-stamp mill, employing amalgamation, concentration, and cyanidation to treat the mixed oxidized and sulphide ores. Before cyaniding, the pulp is separated into sand and slime, the sand being treated by leaching, and the slime by the Butters vacuum-filter method. By mixing the ore from the various parts of the mine, the grade of ore milled is kept at about \$40 or \$50 per ton, the value being almost entirely in gold.

Record Sinking.

The work done in the two shafts of the Brackpan Mines Co., at Johannesburg, furnishes a new record for rapid sinking. In July the No. 2 shaft was sunk 204 ft., which is one foot better than the record for vertical shaft-sinking, made by Leslie Simson at the Simmer West in 1898. At the Brackpan No. 2 shaft, 210 ft. of timbering was placed in position during July. In the No. 1 shaft the same company has averaged 143 ft. of sinking during six months, and an average of 161 ft. during the three months ending with June. This shaft is of the seven-compartment type, and is 8 ft. wide by 39 ft. long. The Simmer West shaft has five compartments, and measures 7 ft. 6 in. by 31 feet.

Since the beginning of the year the Brackpan Mines record has been:

No. 1 Shaft.	Sunk. Ft.	Timbered. Ft.
January.....	98	83
February.....	131	127
March.....	143	158
April.....	148	135
May.....	186	196
June.....	150	143
July.....	125	135
No. 2 Shaft.		
January.....	77	31
February.....	49	57
March.....	100	76
April.....	125	135
May.....	152	166
June.....	170	158
July.....	204	210

The following additional particulars will be of interest:

	No. 1 Shaft.	No. 2 Shaft.
Started operations.....	May 12, '05.	June 1, '05.
Engines started.....	Sept. 16, '05.	Dec. 20, '05.
The depth then being.....	60 ft.	96 ft.
Depth on Aug. 6, '07.....	2,800 ft.	1,930 ft.

Bad ground and much water necessitated large pumps and heavy timbering in No. 2 shaft. This delayed progress from October, 1906, to April, 1907. Since then the average sinking has been 162.7 feet.

Credit for this good mining engineering is due to Charles B. Brodigan, the manager of the mine. Mr. Brodigan is an Associate of the Royal School of Mines.

COMMERCIAL asbestos includes fibrous minerals of two distinct types. The true asbestos is actinolite or tremolite and belongs to the amphibole group, and with it may be placed the other fibrous amphiboles, anthophyllite, and crocidolite. The more important asbestiform mineral, however, is the fibrous variety of serpentine known as chrysotile. Both fibrous amphibole and chrysotile possess qualities which peculiarly fit these minerals for use in the arts. The term asbestos, meaning noncombustible, thus has come to stand for mineral fiber which is more or less resistant to both heat and acids. Although the chrysotile, by reason of its chemical composition, may be affected by very high temperature and strong acids to a greater degree than the amphibole, the greater strength and flexibility of the chrysotile fiber make it the more valuable of the two.

The Prospector.

Enquiries sent to this department are answered free of charge, if submitted by subscribers who are not in arrears. The full name and post-office address of the sender must be given, otherwise no answer will be made. Those who are not subscribers must accompany their questions with a fee of \$3 for each question. No assays are made.

Pearlite or Pitchstone was sent by C. B., of Reno, Nevada.

A specimen of Gneiss was sent by C. D. C., Quartzite, Arizona.

J. G. of Gem, Idaho, sends a piece of Quartzite, carrying some pyrite and galena.

The two specimens from Sisson, Cal., marked O. L. H., are: No. 1, serpentinized rock; No. 2, Rhyolite Tuff.

E. E. N., of Camacho, Mexico, sends: No. 1, Hornblende Gneiss; No. 2, Hornstone; No. 3, Quartzite; No. 4, Quartzite.

The specimen from Nogal, New Mexico, marked C. E. M., is rock containing disseminated grains and crystals of pyrite.

Specimens from the P. D. Co., Silver City, New Mexico, are: No. 1, yellow Ocher; No. 2, Diorite; No. 3, Feldspar Porphyry; No. 4, Quartz, with some Limonite and Malachite; No. 5, Feldspar Porphyry; No. 6, Epidote rock; No. 7, Quartzite; No. 8, Andesite.

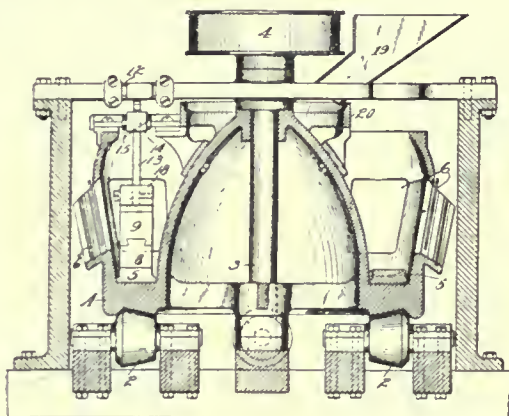
The rocks from Sinaloa, Mexico, marked D. A. McD., are: No. 16, Andesite; No. 17, Quartz Porphyry; No. 18, Andesite; No. 19, Andesite; No. 20, Basalt; No. 21, altered Rhyolite or Andesite; No. 22, Andesite; No. 23, Andesite; No. 24, Rhyolite Porphyry; No. 25, Dacite, No. 26, Basalt; No. 27, Rhyolite; No. 28, Andesite; No. 29, massive Hematite.

VARNISH is a composition or an amalgamation of fossil resins, or gum, linseed oil, and spirits of turpentine, with a certain per cent of oxides worked in to serve as driers. This is varnish in general and applies to all kinds, the proportions and treatment varying according to the purposes for which the varnish is to be used. Gum, strictly speaking, is only properly applicable to those that are soluble in water, such as arabic, senegal, tragacanth, aloes, etc., all of which exude from live trees; but the gums of fossil resins used by the varnish-maker are petrified, only dissolve under great heat, and are the exudations from trees which are extinct. This resinous deposit is found buried in the earth, having laid there from a period before the creation of man. Different kinds are used for different products, the principal of which are Animi or Zanzibar, Sierre Leone, and Benguela; these are found in Africa and the East Indies. Kauri, however, is the resin most used; this comes from New Zealand, and began to be exported in quantity after the Australian gold discoveries. It is estimated since then up to 1904 \$65,000,000 worth has been shipped, and in that year \$52,509,085 worth was shipped to the United States and the United Kingdom. Linseed oil, the other important ingredient, needs no description. It is well known to be the expressed juice of flax seed. This is prepared by boiling, and different makers have different ideas as to the amount and manner of boiling prior to its introduction into the melted gum. Turpentine is used as a dilutant to render the treated gum and oil fluid enough to spread the varnish with a brush, and when the dilutant evaporates it has performed its mission and leaves the resultant film of gum and oil, or, in other words, it leaves all there is of what is essentially varnish.

MINING AND METALLURGICAL PATENTS.

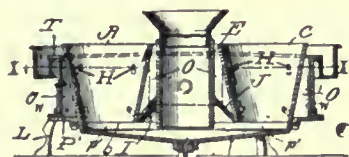
Specially Reported for the MINING AND SCIENTIFIC PRESS.

COMBINED STAMP AND GRINDING MILL.—No. 866,600; George C. Richards, South Berkeley, Cal., assignor to Western Mill & Machine Co., a Corporation of California.



A stamp-mill having in combination a rotary pan, said pan having a trough the outer wall of which is provided with openings for the delivery of crushed material, and the inner wall forming a central cone, a driving shaft passing through the centre of said cone and fixed to said cone, a series of successively arranged die-members in said trough, a stamp-member, a fixed support on the pan, and means forming a horizontal hinge about which said stamp-member may rise and fall to engage successive of said die-members.

AMALGAMATOR.—No. 866,084; William H. Stiglitz, Louisville, Kentucky.



An amalgamator, comprising an approximately circular case having a mercury-holding basin and provided with means for the admission of water under pressure to its interior, said casing also having, within its interior, walls relatively arranged to provide a centrally disposed sluice column, a series of perfectly flaring outlet columns around said sluice column and a chamber surrounding the base of the sluice column and arranged between the same and the outlet columns, said columns and chamber each opening into said basin and the walls of said chamber and the outlet columns having openings for the admission of water thereto.

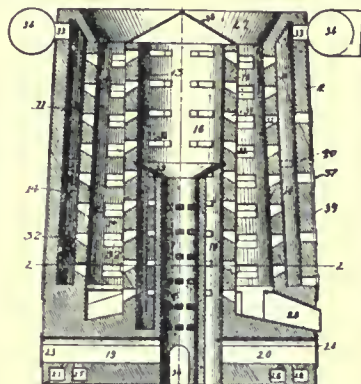
APPARATUS FOR EXTRACTING MINERALS FROM ORE.—No. 865,027; Oscar A. Ellis, San Francisco, California.



An apparatus for separating minerals from ores, having in combination, a long, inclined, open chute or launder, provided with riffles, and a precipitating box located adjacent the lower end thereof, whereby a mixture of ore and chemical solution will flow by gravity down the launder

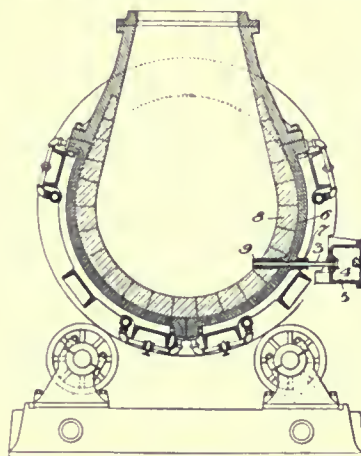
and through the precipitating box together with means for passing an electric current through said precipitating box.

PROCESS OF ROASTING FUSIBLE ORES.—No. 866,580; Albert G. Davis, Washington, District of Columbia.



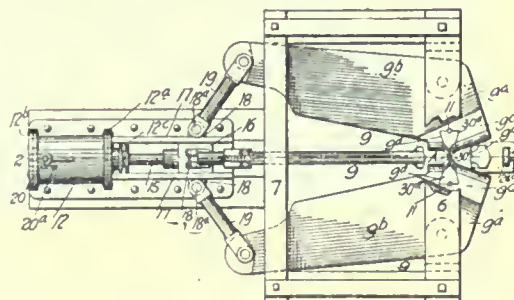
The process of roasting fusible ores which consists in exposing them first to a high temperature in a reducing atmosphere and thereby preventing fusion, and then to an oxidizing gas, substantially as described.

CONVERTER.—No. 865,671; Ralph Baggaley, Pittsburg, Pennsylvania.



A tuyere having a removable sleeve or tube extending into and through the tuyere orifice and having an accessible tool-seating portion.

DEVICE FOR SHARPENING ROCK-DRILLS.—No. 866,041; Elias Lewis, Denver, Colorado.



In a device for sharpening rock-drills, the combination with a suitable base of a frame erected thereon, four levers fulcrumed in said frame, dies secured to the converging extremities of the short arms of said levers, a cylinder located on said base, a piston having a reciprocating movement in said cylinder, means for admitting and exhausting air or steam in and from said cylinder, a piston rod secured to said piston, guide ways erected on said base, a cross head having a reciprocating movement in said guide ways, being connected with said piston-rod, connecting rods pivotally connected with said cross head and with the extremities of the long arms of said levers, and suitable means for adjusting the length of said connecting rods.

Power Transmission by Manila Rope.

By G. P. HUTCHINS.

The use of rope for transmitting power is one of the most recent developments of modern engineering. One of the causes for late acceptance of this cheap and ready method was the lack of reliable and sufficiently flexible rope of reasonable endurance. Since this means has been perfected, it has displaced gearing and belting in a great number of installations.

In general terms it may be said that where the distance between driving and driven shafts is not less than 10 nor more than 1,200 ft., fibre rope running in properly grooved sheaves offers the cheapest, most efficient, and most durable

the total destruction of fibres by internal movements. No rope can long endure this destructive abrasion without lubrication. The degree of skill with which the lubricant is applied and its character, determine to a great extent the rope's durability. External dressings do not soak into the places where the real friction takes place, so that their effect is merely local, leaving the interior dry. Soaking the strands in tallow before laying up gives imperfect protection. Tallow has not body enough to cling to the fibres. It works out or dries out. The free fatty acids contained in tallow attack the fibres, and if it becomes rancid it causes the rope to rot. 'American' rope is lubricated by thoroughly soaking the core as well as a number of inner yarns of each strand in a bath composed mainly of flake graphite, mixed

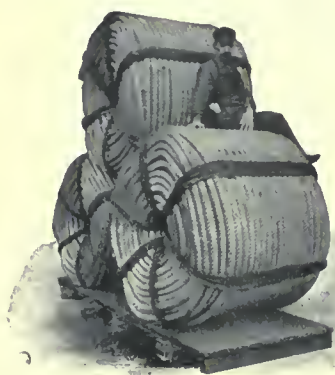


Fig. 1.

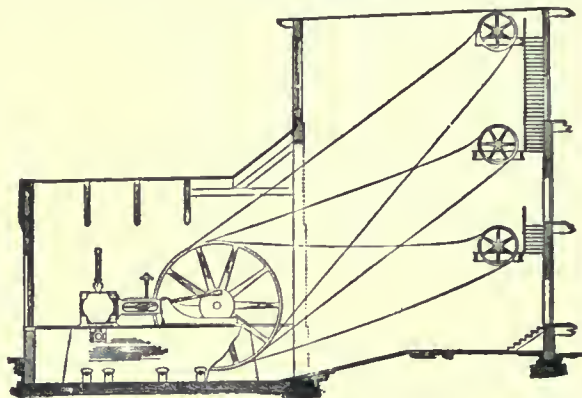


Fig. 3.

means of power-transmission. No matter at what angle the driver may stand to the driven shaft, power will be delivered at minimum loss and with greatest certainty.

Fig. 2 shows an over-roof drive between separated buildings, transmitting about 80 hp. around corners and at angles quite impossible to any other known form of drive. When shafts are even slightly out of alignment, the wear and noisy pound on any form of link connection are prohibitive. Belts, under such circumstances, cannot be kept on their pulleys. Rope, however, owing to its flexibility and uniform figure of contact, can adjust itself to new positions in the sheave-grooves, thus permitting a considerable degree of eccentricity without derangement of service.

Transmission rope made from manila hemp is particularly

with fish oils of a neutral character. Fig. 4 shows a cross-section of a four-strand 'American' rope, the shaded portions indicating the graphite lubricated core, or heart, and yarns of each strand. This flake graphite is precisely the same material which has established its reputation among engineers for the lubrication of engine-cylinders and bearings. The lubricating compound permeates all the fibres of the completed rope, lodging in the hollows, smoothing out the uneven places, and forming layers of unguent between all fibre and yarn surfaces. This constitutes perfect lubrication. After a short period of service, enough of this mixture is soaked into the external fibres to form a glossy black metallic coating on the outside of the rope, which is absolutely impervious to water. Ropes thus lubricated re-



Fig. 2.

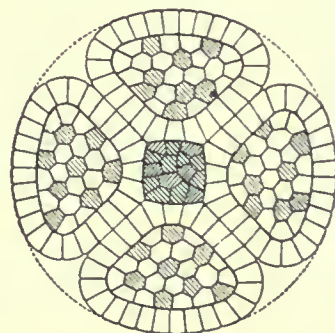


Fig. 4.

subject to internal wear unless scientifically lubricated with the best kinds of material. Weight for weight, these ropes are as strong as steel in the direction of their length, but have little transverse strength owing to their cellular structure. When the stems are sub-divided by machinery, the fibres are made peculiarly rough and splintery. When these rough surfaces are bent around a sheave, they slide on each other with much force, every part of the rope section rubbing upon its surrounding fibres. This may happen many times in one minute, according to the distance between shafts. It is absolutely destructive to the rope, the fibre being wholly ground to powder. If the strands of a worn rope are untwisted, a quantity of fine powder will be found in the interspaces between the yarns produced from

quire no dressing or any attention as to maintenance. If not absolutely abused, they will last ten years and even longer.

For driving the mainshafts on a series of different floors, from an engine in the basement or in an adjoining engine house, the English system is to be preferred. Such an installation for a cotton mill is shown in Fig. 3. This shows the simplicity and compactness of power distribution and the advantages over driving by intermediate stages from floor to floor, in which all the upper floors are shut down by break down on the lower floor. This vividly illustrates the enormous factor of safety provided in the great number of individual ropes, precluding all possibility of the engine's running away from break in the transmission.

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TABLE OF CONTENTS

Editorial:	Page.
Notes.....	441
Smelter Smoke.....	442
Speculation or Investment.....	442
General Mining News.....	445
Special Correspondence.....	450
Denver, Colorado.....	
Mexico City.....	
Butte, Montana.....	
Salt Lake, Utah.....	
Cripple Creek, Colorado.....	
Pioche, Nevada.....	
Concentrates.....	456
Discussion:	
Conveying Tailings in Launderers.....	C. W. Van Law 457
Methods of Advertising.....	Charles S. Palmer 457
The Blow Out.....	G. F. Beardsley 458
Articles:	
Right of Mining Locators to Cut Timber in Public Domain for Mining Purposes.....	458
Handling Residue.....	459
Acetylene Lighting.....	N. Goodyear 460
The Diamond Core-Drill in Prospecting.....	
.....	Lewis T. Wright 461
The Nile as a Mining River.....	Alexander Del Mar 463
Lining for Tube-Mill.....	466
The Camp Bird Mine.....	466
Attachment Between Rope and Sinking Bucket.....	
.....	Chas. B. Brodigan 467
The Great Comstock Lode.....	G. McM. Ross 468
Rapid Hoisting With Light Equipment.....	470
.....	George A. Packard 470
Transport of Machinery in Mountainous Countries.....	
.....	H. H. Kress 471
Mining and Metallurgical Patents.....	472
The Prospector.....	470
Departments:	
Personal.....	444
Market Reports.....	444

Editorial.

THE RIGHT to cut timber on the public domain is a much mooted question among miners. On another page we take pleasure in quoting Mr. Samuel Pratt, United States District Attorney of Nevada, and to his statement we append a few remarks, which will put the present status of the question fairly before the mining community.

PROSPECTING with the diamond-drill has made great advances in recent years, and in the wake of wide experience there has come a better knowledge of the methods likely to give the most satisfactory results. To have a good tool is one thing; to use it effectively is another. In this issue, Mr. Lewis T. Wright, general manager for the Mountain Copper Company, gives advice based upon his personal experience. It will prove useful to mine operators.

IT IS ANTICIPATED that the gold production of the Transvaal in 1907 will approximate 6,290,000 fine ounces, worth \$126,000,000. This is more than double the output made in 1903. At the present time the average monthly yield is 550,000 ounces, valued at about \$11,000,000. There is good reason to believe that the Rand has reached the zenith of its productiveness, and that succeeding years will see a large, but declining, output.

RIVERS have a romance of their own. By their names they suggest the early explorers that first found them; in their associations they recall whole chapters of human history. Of all rivers, the most mysterious, the most historic, the most beneficent, is the noble stream that makes Egypt. We associate the Nile with the poetry of the past and the engineering of today, but it is always as a factor in regional irrigation, never as connected with mining. For this reason the article by an encyclopedist like Mr. Alexander Del Mar will be read with interest.

FROM MEXICO our regular correspondent writes concerning the progress being made at Guanajuato. It is a pleasure to publish the good news. The group of energetic technical men who took hold of the old mines of the Veta Madre and rehabilitated them, substituting modern machinery for the *matacate*, and the cyanide annex for the *patio*, interjecting the virility of today in place of the complacency of yesterday—this group of Anglo-Americans, mainly American, deserves the reward of financial success and the esteem due to professional ability. It has not been plain sailing, but by keeping the prow pointing steadily in one direction the haven has been reached and magnificent holes in the ground have been made once more profitable mines.

The construction of the branch railroad from Marfil, linking Guanajuato with the outside world, is an important step forward; so also is the Porfirio Diaz tunnel, designed to take any excessive rainfall and to prevent a flood such as that of July 2, 1905. To the Mexican authorities our countrymen owe a good deal of help in their efforts to develop the mineral deposits of Guanajuato, and the recognition of this fact will be accorded gladly.

OUR CORRESPONDENT at Denver makes some humorous remarks concerning certain phases of journalism as they are exemplified by a contemporary at Colorado Springs. The responsibility of publishers for the advertisements they display in their papers is a matter that has both its humorous and its serious side, and it is possible that the serious consequences are emphasized most effectively in a humorous way. Mr. T. T. Read, our correspondent, who is about to take an appointment in the University of Tokio, is not without the salt of humor, without which life would lose its savor.

FIVE THOUSAND revolvers, estimated to have cost \$15,000, were taken out to sea and thrown overboard off Sandy Hook on September 28. All of these were weapons seized by the police in New York within the last year and a quarter. The heterogeneous collection of pistols, a veritable arsenal of crime, was collected mainly from Italians during a recent crusade against the carrying of concealed weapons, and from the Chinese during the Tong fights. Formerly revolvers confiscated by the police were sold to pawnbrokers and it was found that they were returned to bad use. By the act of the last Legislature it was provided that the Commissioner of Police might dispose of such property by destroying it. He did so, effectively, and rid the world of a few unnecessary instruments of destruction.

Smelter Smoke.

A DISPATCH from Butte states that Oliver T. Crane, Master in Chancery, who was appointed referee to hear the testimony in the case brought by farmers in the Deer Lodge valley against the Washoe smelter of the Amalgamated Copper Co., has submitted his report to Judge Hunt of the United States Court, and that on October 25 objections to his findings are to be heard, preparatory to a final judgment. The referee finds that the complainants, who are farmers and landowners in the valley over which the smoke from the smelter is supposed to pass, have been damaged, and the plaintiff, F. J. Bliss, is adjudged to be entitled to special damages in the sum of \$350, that amount being loss sustained by him by reason of the injury done to his land by the smoke. The main conclusion of the referee is that a tremendous injury and practical paralysis of the business of the State of Montana would follow such an injunction as has been asked for by the complainants, and that the farmers themselves would suffer greater loss by such suspension than they do now from the fume. It remains for Judge Hunt to decide whether an injunction is to be granted. As most of the mines at Butte are dependent upon

this smelter for the treatment of their ore, the final decision will be awaited with keen interest. Incidentally, we may add that while the referee finds that damages amounting to \$350 were caused by the smoke, the fighting of this case by the Amalgamated Company has cost fully \$500,000, the transcript of evidence covering 27,000 pages of typewritten matter. It is also known that the complainant sold his ranch and left the Deer Lodge valley, going to Idaho, and that he came back and bought another ranch before the suit was started. In other words, this is a good example of an industry essential to the well-being of a community, and, indeed, to a whole State, being harassed by men whose public spirit can be called in question, and whose motives are distinctly anti-social. We hope most sincerely that it may be established that farmers and others are entitled to full payment for any damage done to them, but that they cannot use that damage as a weapon for blackmail or for hindering the metallurgical operations so essential to the development of the West.

Speculation or Investment.

IN OUR LAST ISSUE a reader took exception to a certain statement of ours in which we had said that mining was a sane speculation or a silly gamble, but never an investment. At about the same time an experienced mining engineer happened, in conversation, to express regret that anything so sweeping should have been said in print, because it was true—painfully true—and calculated to do harm to legitimate business. To this we demur, frankly and cheerfully; the economics of mining is a study based upon scientific investigation, therefore the recognition of the truth cannot be injurious; on the contrary, nothing is so harmful, so utterly destructive, as make-believe—the acceptance of things as they are *not*. Mining is based on the application of science to industry, not upon the utilization of imagination in promotion or of fancy to finance; therefore, the more we get alongside of facts, the safer we shall be and the more successful—in the long run—in making money by digging ore.

Speculation is a more or less risky use of money in the expectation of considerable gain, or any business involving such a use of money. Investment is the laying out of money productively, especially in a permanent manner. In the first the emphasis is on the idea of riskiness and large gain; in the second, the emphasis is on productiveness and permanency. To make the distinction clear and brief, it may be said that a speculation is the temporary use of money for large gain, which involves commensurate risk; while an investment is a permanent placing of money at a small interest, which promises a correspondingly less chance of losing the principal. Now, we do not lay stress on the riskiness of mining or the impermanence of it save as it balances the large gain to be made by the judicious use of knowledge and experience. Surely it will do no harm to recognize the essential facts pertaining to the industry in which we are all so keenly interested. Shall we live in a fool's paradise

and call a mine that fluctuates in value from day to day, that may be worth either ten times as much a year hence or one tenth its present valuation, that may suffer from fire, from a creep, from flooding, from sudden change in the ore, from any one of the many vicissitudes incidental to such enterprises—shall we call it an 'investment' and insist that it has a fixed value, superior to the vagaries of ore deposition, the chances of management, or the tyranny of nature? If we do prefer to shut our eyes to facts, we shall do as others have done, and do, continually. Men think all men mortal but themselves; they regard all mines as likely to peter out but their own. So they get nasty jars, and lose money, and swear that mining is a heedless gamble. That is the other extreme. You can make it a gamble by disregarding all the precautions that make it a sane speculation, but, we insist, a man cannot add a cubit to his stature by much thinking, and he cannot metamorphose a speculation into an investment by make-believe.

A striking example is available. When the gold-bearing banket of the Rand was sampled and tested, when the orebodies at Johannesburg had been measured and assayed, when the metallurgical reduction of the ore had been decided upon, it was stated, confidently, by many first-rate engineers, and by more promoters, that here at last we had gold veins that were regular as coal seams and mining enterprises that were as safe as British Consols or United States bonds. So there was a boom; this was in 1895 and at recurrent intervals in later years. The shares of the mining companies went kiting, naturally, for they were capitalized on earnings estimated at 20 or 25 per cent, and when the public had been filled with ideas of a safe investment, of a sure thing, of a form of gold mining the like of which the world had never seen, they naturally thought that a return of 4 or 5 per cent was enough. Capitalists and their followers talked of amortization; actuaries' tables were brought into service; the nicest kind of elaborate calculations were made of the life of the mines, of their ability to repay the capital invested, and of furnishing the required interest on the "investment." Investment, of course, no more of your silly gambling in American or Canadian mines; in South Africa they had the real thing, beyond a peradventure. It was as good as the Bank of England, and more profitable. And the sequel; need we tell it? No chapter in the history of mining is so significant or so bespattered with a tawdry romance. The ore proved patchy—as elsewhere; the lodes were interrupted by dikes—as elsewhere; the orebodies proved to be erratic—as in the risky mines of other regions; the estimates of ore reserves in several cases proved fallacious—as anything human is fallible; the calculations of profits turned out as disappointing in many instances as in the less regular, less simple, less persistent veins exploited in America or Australia. No new type of gold mining had been discovered; it was the old story—big risk and big gain. On the portals of the mines at Johannesburg it might be written, "Dead things will crawl; it is better to be sure than sorry." And so that bubble is exploded and the irides-

cent films of it have made gay the nights of London, Paris, and Berlin. It was a grand gamble; the misrepresentation of fact and the ignorance bred of make-believe had gone their inevitable way; never an investment, mining on the Rand became a wild debauch of speculation; shares were run to five or ten times their worth, men lost money as they did at Monte Carlo or Ostend, the supposititious investments in South Africa were no better than the chances offered to speculators at Cripple Creek, at Bingham, in Arizona, in Nevada. Many mining engineers, lured by the opportunity of participating in big promotions, others carried away by an honest enthusiasm, did, indeed, give their authority to the over-capitalization and, indirectly, to the wild dealing in shares, consequent upon fanciful notions as to the character of the mining enterprises at Johannesburg; but not all. There were many who spoke out fearlessly, and foremost among them was Mr. J. H. Curle, who has seen his warning prove true and is now in the ungracious position of being able to say—but he does not bother to say it—"I told you so." This reference is interjected just to indicate that everyone was not deluded and that the man who pins his faith to facts is likely in mining to win both money and reputation. However, now that the truth is known, the Rand is on a safe basis. People no longer deem 3, 4, or 5 per cent sufficient interest and they do not buy stock to put it in a safe as a heritage for their children; they recognize that mining on the Rand, if properly conducted, affords good chances of making money rapidly, and that the risk is commensurate with the chance of gain; in fact, like mining anywhere else, it is a sane speculation.

PRODUCTION OF GOLD in Australasia continues to decline. According to statistics received for the first half of 1907, there is a decrease of 170,000 ounces as compared to the first half of 1906. Of this decrease 66,000 oz. is due to the diminishing production of the gold mines in Western Australia, particularly Kalgoorlie. No new mining districts have been discovered and many of the largest mines exhibit traces of exhaustion. This fact has become steadily more apparent, and among other suggestions, it has prompted a plan for converting the State into one huge mining company. This idea is a development of the argument employed in support of the big water scheme for supplying the gold-fields, which was carried out successfully by the State. While this audacious proposition is not likely to be carried out, it does indicate the recognition of a waning gold mining industry. In Victoria there is a decrease of 55,000 oz., due mostly to the lessened contributions from the older goldfields of Bendigo, Ballarat, and Maldon. In Queensland the decrease is 25,000 oz., traceable to a smaller output from Charters Towers and Gympie. In New Zealand the decrease is 40,000 oz., despite the maintenance of steady production by the great Waihi mine. The dredges in Otago and on the West Coast are not doing as well as formerly. In New South Wales only is there an increase; this amounts to a trifle over 5,000 oz. and represents the by-product from the smelting of copper and lead ores.

Personal.

ROWLAND C. FEILDING is in Newfoundland.
 FRED B. REECE is on a tour in Spain and Portugal.
 NORRIS ENGLISH has left San Francisco and is in Utah.
 N. C. BONNEVIE has returned to Denver from New York.
 SAMUEL NEWHOUSE has returned to Salt Lake from Europe.

W. B. WAINWRIGHT has returned to London from Mexico.

ROBERT E. CRANSTON has an office in the Physicians Bdg., Sacramento.

CLAUDE T. RICE is now on the staff of the MINING AND SCIENTIFIC PRESS.

D. J. A. REES has been appointed manager of the Tuco Cheira mines, in Peru.

M. O'ROURK is superintendent of the Gold Prince mill at Animas Forks, Colorado.

FORBES RICKARD is examining tungsten deposits in Boulder county, Colorado.

J. M. ELMER, of Cobalt, Ontario, is at the Old Hundred mine, near Silverton, Colorado.

WALDEMAR LINDGREN was at Portland recently, on his return from Ketchikan, Alaska.

E. C. LIMBACH, of Denver, has gone to Tulameen, B. C., to investigate a platinum property.

SCOTT TURNER has been appointed superintendent of the Granny mine at Manhattan, Nevada.

GEORGE COPELAND is manager for the Caribou Gold Mining Co. at Bullion, British Columbia.

FRANK BAIRD is smelter superintendent for the Penn Copper Co. at Campo Seco, California.

C. J. GARVIN has resigned as manager for the Green Mountain M. Co. at Silverton, Colorado.

BEN TIBBRY, consulting engineer of the Mascot Copper Co., in Arizona, has returned to Salt Lake.

ROGER TAYLOR is superintendent of the copper reduction department of the Tacoma Smelting Company.

W. H. BLACKBURN, superintendent for the Tonopah Mining Co., of Tonopah, is in Denver for a few days.

HOWARD W. DU BOIS, of Philadelphia, was in San Francisco this week, on his way from British Columbia to Nevada.

E. P. JENNINGS, of Salt Lake, recently examined a property near Battle Mountain, Nevada, for a Salt Lake syndicate.

A. A. HASSAN has organized an exploration company for work in Ontario and Quebec, with offices at 250 Toronto St., Toronto.

J. GEARY has returned to San Francisco from the Round Mountain district of Nevada owing to the serious illness of his father.

W. J. WATSON is the superintendent of the Tyee Copper Co.'s smelter at Ladysmith, Vancouver Island, British Columbia.

DONALD F. CAMPBELL is general manager of the mines and smelter of the Noble Electric Steel Co., in Shasta county, California.

THEO. L. LAMMERS has resigned as general manager for the Panhandle Smelting Co., and will take charge of mining operations in Montana and Idaho.

JOHN DERN, president of the Consolidated Mercur Gold Mines Co., of Utah, has been making an inspection of the Nevada-Douglas and other mines at Yerington, Nevada.

J. R. FINLAY, F. L. SIZER, W. H. WILEY, and H. V. WINCHELL are experts in the lawsuit pending between the Federal and Bunker Hill companies, at Wallace, Idaho.

G. CHESTER NOBLE and CHAS. S. DAVIDSON have opened offices in the Crocker Bdg., San Francisco, to engage in the practice of electrical, hydraulic, and power development engineering.

Latest Market Reports.

LOCAL METAL PRICES—Oct. 10.

Antimony.....	13@17c	Quicksilver (flask).....	\$38@39
Copper.....	22.70@23.70c	Spelter.....	7@ 7.75c
Pig Lead.....	4.85@ 5.80c	Tin.....	40.50@42c

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.

Date	Electrolytic Copper	Lead	Spelter	Silver
Oct. 3.....	14 $\frac{1}{8}$	4 $\frac{3}{4}$	5.38	66 $\frac{1}{2}$
" 4.....	14 $\frac{1}{8}$	4 $\frac{3}{4}$	5.38	66 $\frac{1}{2}$
" 5.....	14 $\frac{1}{8}$	4 $\frac{3}{4}$	5.38	66
" 6.....	Sunday.	No market.		
" 7.....	14	4 $\frac{3}{4}$	5.43	65 $\frac{1}{4}$
" 8.....	13 $\frac{7}{8}$	4 $\frac{3}{4}$	5.48	65
" 9.....	13 $\frac{1}{4}$	4 $\frac{3}{4}$	5.53	64 $\frac{1}{8}$

ANGLO-AMERICAN SHARES.

Cabl'd from London.

	Oct. 2.	Oct. 9.
Camp Bird.....	0 17 9	0 18 1 $\frac{1}{2}$
El Oro.....	1 5 0	1 5 0
Esperanza.....	2 0 7 $\frac{1}{2}$	2 0 7 $\frac{1}{2}$
Dolores.....	1 3 9	1 5 0
Oroville Dredging.....	0 16 0	0 15 7 $\frac{1}{2}$
Tomboy.....	1 7 6	1 7 6

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

MINING STOCK QUOTATIONS—NEW YORK.

Closing Prices.

	Oct. 2.	Oct. 9.
Bingham Central.....	3 $\frac{1}{4}$	1 $\frac{1}{2}$
Boston Copper.....	15 $\frac{1}{4}$	13 $\frac{3}{4}$
Cumberland Ely.....	6 $\frac{1}{2}$	6 $\frac{1}{8}$
Dolores.....	5 $\frac{1}{2}$	6
El Rayo.....	2	2 $\frac{1}{4}$
Guanajuato Con.....	3	2 $\frac{1}{2}$
Glroux Con.....	4 $\frac{3}{4}$	4 $\frac{1}{2}$
Greene Con.....	12	12
Nevada Con.....	9 $\frac{1}{2}$	9 $\frac{1}{2}$
Nipissing.....	6 $\frac{1}{2}$	6 $\frac{1}{2}$
Tennessee Copper.....	30 $\frac{1}{2}$	30
Tonopah Ex.....	1 $\frac{1}{2}$	1 $\frac{1}{2}$
Tonopah-Belmont.....	1 $\frac{1}{2}$	1 $\frac{1}{4}$
Tonopah.....	10 $\frac{1}{2}$	9 $\frac{1}{4}$
United Copper.....	47 $\frac{1}{2}$	46 $\frac{1}{2}$
Utah Copper.....	21 $\frac{1}{2}$	22

(By courtesy of Hayden, Stone & Co., 25 Broad St., New York.)

COPPER SHARES—BOSTON.

Closing prices.

Closing prices.

	Oct. 10.		Oct. 10.
Adventure.....	13 $\frac{1}{4}$	Michigan.....	8 $\frac{1}{4}$
Ahmeek.....		Mohawk.....	44
Allouez.....		Nevada Con.....	9 $\frac{1}{4}$
Amalgamated.....	56 $\frac{1}{4}$	North Butte.....	43
Arcadian.....		Old Dominion.....	21 $\frac{1}{2}$
Atlantic.....	5	Osceola.....	88
Balaklala.....	4 $\frac{1}{2}$	Parrot.....	12
Bingham Con.....	5 $\frac{1}{4}$	Phoenix.....	
Boston Con.....	13 $\frac{1}{4}$	Quincy.....	76
Butte Coalition.....	13 $\frac{1}{4}$	Raven.....	
Calumet & Arizona.....	98	Rhode Island.....	2 $\frac{1}{2}$
Calumet & Hecla.....	630	Santa Fe.....	
Centennial.....	19	Shannon.....	9
Con. Mercur.....	35	Superior & Pittsburg.....	8 $\frac{1}{4}$
Copper Range.....	55 $\frac{1}{4}$	Tamarack.....	65
Daly-West.....	10 $\frac{1}{4}$	Trinity.....	12 $\frac{1}{4}$
Franklin.....	7 $\frac{1}{2}$	United Copper com.....	46
Granby.....		Utah Copper.....	21 $\frac{1}{2}$
Greene-Canaan, etc.....	7	Victoria.....	4
Isle Royale.....	14 $\frac{1}{4}$	Winona.....	4 $\frac{1}{2}$
Mass.....		Wolverine.....	107

(By courtesy of E. F. Hutton & Co., 480 California St.)

SOUTHERN NEVADA STOCKS.

San Francisco, Oct. 10.

Atlantia.....	\$ 28	Laguna.....	1.00
Belmont.....	1.75	Little Tonopah.....	1.00
Columbia Mtn.....	25	Manhattan Con.....	30
Combination Fraction.....	1.02 $\frac{1}{4}$	Midway.....	75
Daisy.....	60	Mizpah Extension.....	10
Fairview Eagle.....	95	Mohawk.....	12.00
Florence.....	3.15	Montana Tonopah.....	1.95
Gold Bar (Bullfrog).....	35	Nevada Hills.....	4.25
Gold Bar (Goldfield).....		Red Top.....	3.00
Goldfield Con.....	5.32 $\frac{1}{2}$	Sandstorm.....	25
Goldfield of Nevada.....	1.20	Silver Pick.....	33
Gold Kewanas.....	25	St. Ives.....	45
Great Bend.....	29	Tonopah Extension.....	1.40
Jim Butler.....	59	Tonopah of Nevada.....	9.37 $\frac{1}{2}$
Jumbo.....	3.00	Tramp Con.....	17
Jumbo Extension.....	1.17 $\frac{1}{2}$	West End.....	59

(By courtesy of W. C. Ralston, 368 Bush St.)

General Mining News.

ALASKA.

At Candle City, north of Nome, C. L. Morris has contracted to build one of the largest ditches in the Seward Peninsula, designed to supply all Candle with water. C. F. Ashford surveyed the course. The chief intake will be on Quartz creek, and it will also get the Hunter creek water. The length will be nearly 40 miles.—Miners are scarce in many parts of the Kaugarok. In Macklin gulch, the pay is \$7 per day and board.—The Port Clarence M. & D. Co. has been incorporated to work claims on Slide Mtn. that show sylvanite ore. Joseph Bartolis is president and Paul Krets treasurer.—Reports from Fairbanks state that the labor strike in the Tanana camp is practically over and the creeks are busy. Underground men receive \$6 and board per day of 10 hours, and top men \$5 for 8 hours. Latest news from the Innoko district says that a few claims are being worked, but enough prospecting has not yet been done to prove the camp. Work is being done on Gane creek and its tributaries, especially Ophir and the left fork.

The annual exodus of miners is at its height. All the boats from Alaska are crowded with miners from the coast and inland districts who are hurrying South to spend the winter. This rush will keep up until winter prevents further navigation.—The thefts of gold from the registered mail pouches still continue. It is said to be due to lack of proper guarding of the registered mail. Often the gold in the registered mail sacks, coming down on the river steamers from camps of the interior, amounts to several hundred thousand dollars, yet no guard is stationed over it. It is locked up in a stateroom and only occasional peeps at it from the purser by day and the watchman on the boat safeguard it at night.

ARIZONA.

COCHISE COUNTY.

While few men have been laid off at Tombstone, many of the miners have been taken from the stopes and put upon development.—Jack Kelly, who located the claims now owned by the Bisbee Extension Co., has discovered, near the old Black Jack mine last worked in 1883, a promising vein, carrying gold, silver, and copper.

GILA COUNTY.

The copper output of the Old Dominion Co. for September shows no decrease, being 3,577,000 lb. The various properties of the Superior & Boston are looking fine. The Gem shaft is 1,025 ft. deep, but still in country rock.

GRAHAM COUNTY.

(Special Correspondence).—The new furnace at the Shannon smelter at Clifton has been blown-in. The output for September was 1,500,000 lb., representing 15 days' run of the new furnace. Perry & Spence, whose mines are in the Carlisle district, 20 miles northeast of Clifton, will make regular shipments to the Shannon smelter. Several cars of ore have already been shipped from this mine. The ore is hauled by wagon to Duncan whence it is shipped to Clifton. Several other mines at Carlisle will soon be producing. Some rich silver ore has been struck on claims in the mountains west of Morenci. These claims were located by Frenchy Langermann; since then he has associated with him several outside parties.—The last six feet of the shaft at the Oregon mine, near Clifton, belonging to the Clifton Gold & Copper Co., is in ore. The shaft will be sunk to a depth of 100 ft. Patches of native copper found in the wall-rock indicates a similarity to the old Longfellow mine. This company has also begun to sink a shaft at their Santa Rita mine on the Coronado railroad, 12 miles from Clifton, where some assays as high as 4% copper have been obtained.

Phoenix, Oct. 8.

All the departments of the Detroit Copper Co. were closed down September 24 in respect to D. Willis James. Every camp of the Phelps-Dodge company, as far as possible, was shut down for the same reason.—The Clifton Gold & Silver Co. was recently organized to develop 22 claims near Morenci, which are surrounded by mines of both the Ar-

izona Copper and the Detroit Copper Co.—The New England & Clifton Co. intends to shut down its Copper King mine. The completion of the tramway to the Antietam mine of this company, has been greatly delayed by the cave which occurred some time ago in the Shannon tunnel.

PINAL COUNTY.

(Special Correspondence).—The Copper Creek Mining Co., operating about 14 miles east of Mammoth, has recently opened several large bodies of fine ore. The four most important workings show bodies of ore as follows: In the first, 7 ft. of rich copper glance at the 200-ft. level; in the second, 52 ft. of carbonate and oxide ore on the first level; in the third, 28 ft. carbonate ore on the first level, 37 ft. carbonate and oxide on the second level, and 45 ft. of good sulphide on the third level; the other working has 73 ft. of carbonate and oxide on the first level, and solid ore all the way down to where the second station will soon be cut. The company is receiving estimates on a 300-hp. central power-plant, and a smelter, which will be installed as fast as the work can be done. An electric surface tramway two



Map of Arizona.

miles long will be put in to handle ore from the mines to the smelter. A post-office, called Copper Creek, has been established at the company's camp.

Copper Creek, Oct. 7.

The old Reward copper mine, 30 miles south of Casa Grande, has been sold to a group of men including H. B. Hovland, L. C. Shattuck, H. A. Smith, S. R. Kauffman, and E. N. Breitung. Charles S. Morris will be the manager of the new organization, which is known as the Casa Grande Development Company.

YAVAPAI COUNTY.

The decline in the price of copper has not affected work in the Jerome district.—The settling of the United Verde smelter has stopped, and construction work on the new furnace is being rushed.—The long tunnel is in 1,550 ft., and when completed will be 7,200 ft. long. The United Verde company is rebuilding the Walnut Spring dam, the water to be conveyed to the smelter through two miles of 10-in. pipe. A 500,000-gal. oil-storage tank is completed at Jerome Junction.—Three shifts are sinking the Verde Grande shaft, and good progress is being made in the Boston Jerome shaft.—The Arkansas-Arizona shaft went down 78 ft. during last month.—Mac Willard has driven a tunnel 515 ft. in the Squaw Plad district, and has a south drift 150 ft. long from the 350-ft. point.—The old 265-ft. shaft of the Sycamore Copper Co. has been enlarged 165 ft. down; a

new road has been built to the power-house and shaft, and an engine installed to run the blower.—Another 80-hp. boiler has been ordered, and a station pump.—The long tunnel at the Eureka is progressing satisfactorily.

CALIFORNIA.

AMADOR COUNTY.

The south drift of the 3,000-ft. level of the Kennedy mine has cut the vein. The ore is three feet wide, but the vein-filling is over nine feet wide. This orebody south of the shaft is the most remarkable both as to size and character that has ever been found in this mine. It is continuous from the 2,400-ft. level to the 3,000-ft. level; in places it is 1,000 ft. long while it sometimes attains a width of 30 feet. While the bulk of the ore is of milling grade, still much bonanza ore occurs in it. The shaft at the Kennedy is to be sunk another 150 feet.

BUTTE COUNTY.

The Butte County Dredging Co. has purchased land on Butte creek, near Chico, on which they propose to install a dredge.

INYO COUNTY.

Considerable work has been done this year at the mines near Big Pine and most of them look quite encouraging. As the owners are not trying to sell their mines, little is heard about the camp.—Twenty miles east of Big Pine is the Eve copper mine, where 30 men are working. Schwab is supposed to be the real owner of this mine. The main shaft is 250 ft. deep and will be sunk to a depth of 400 ft. Developments indicate that the vein down to the 250-ft. level has a width of about 80 ft.—Further to the southeast is the lead prospect which was located four months ago by J. P. Fitting. The vein-filling is six feet wide with a streak 12 to 16 in. wide, rich in gold, silver, and lead.—Twelve miles down the valley from Big Pine is the Poverty Hill mine of the Buckeye company. The shaft is 159 ft. deep and the development indicates a wide vein of free-milling ore.

KERN COUNTY.

The well being sunk by the Yellow Aster Co. is 425 ft. deep at present and a large amount of water is flowing from it.

NEVADA COUNTY.

(Special Correspondence).—The Morning Star mine at Randolph Flat has been purchased by the Nevada County Midas Co. from James Bros. The new owners will sink a double-compartment shaft, and install a gasoline hoist and pump.—A rich shoot of ore has been struck near the 300-ft. level in the Kenosha. The Cornish pump has been installed on the 300-ft. level, and sinking on the shaft is about to commence. George W. Root is manager.—Another rich strike is reported from the California, the latest discovery being made about 20 ft. below the former pocket.—Good ore has been struck in the bottom of the 160-ft. shaft of the Gold Mound, and also in a drift at a depth of 105 ft. Some of the ore assays \$400 per ton. Howard Dennis is the superintendent.—Sinking has been resumed at the Central shaft and is progressing at the rate of 5 ft. per day. Rich ore is being taken from the 2,300 level in the North Star. Much development work is under way.—The North Star has declared the regular quarterly dividend of 20 cents per share.—Several good strikes are reported in the lower levels of the Empire, with excellent ore being taken from various points.—Operations are about to be resumed at the Sunflower, after a period of inactivity.—Several drifts are being run at the Conlan to strike the vein.—Good ore continues to come from the lower level of the Brunswick. The lode is improving with depth, and the average is excellent.—A shaft is being sunk on the Gambrinus vein, near the Gaston mine.—It is reported that the Gaston will resume operations at an early date.—The vein recently encountered in the lower levels of the Murchie is showing up well, and some rich ore is being extracted.—Good ore is being taken from the lower levels in the Champion, where much development is being carried on. The mill is running constantly on ore running from \$20 to \$50 per ton.—It is reported that the Gold Flat will resume before the end of October.

—Good ore continues to come from the California copper mine near Spenceville. The tunnel has opened up a large body of sulphide ore.—Local stockholders in the New York-Grass Valley have decided to oppose the action of the management, which provides for the transfer of the mine to a new company to liquidate indebtedness, with the provision that if the amount is not paid within one year, the property will pass completely to the new organization. The local people demand that the period for payment be increased to three years, and will bitterly contest a shorter period.

Grass Valley, Oct. 7.

The Morning Star property at Randolph Flat, two and a half miles west of Grass Valley, recently passed into the hands of the Nevada County Midas Mining Co., which is mainly composed of local people.

At the Gold Mound mine at Deadman's Flat, rich ore has been struck in a drift at the 105-ft. level. A few days later still richer ore was struck in the shaft at a depth of 160 ft. The ore carries galena and metallic gold and is seven feet wide. The Gold Mound mine is in new ground some distance west of the older mines. Last week rich ore was also struck in the California mine at Deadman's Flat but, as the California mine is one of the older mines of the camp, this strike is not so important to the camp in general as that at the Gold Mound.—The developments during the last few weeks at the Austin mine, in Willow Valley district, have been very satisfactory. High-grade ore has been found in the north drift where a 14-in. vein has been found. As this vein was only from 4 to 8 in. wide where developed nearer surface, the owners are greatly encouraged. In the south drift of the 400-ft. level a strong vein 2½ ft. wide of good milling ore is being developed.

PLACER COUNTY.

(Special Correspondence).—The Placer Gravel Mining Co. at Last Chance is running a cross-cut and raise from the old El Dorado tunnel to catch the lower end of the Big Lead channel, which they cut some time ago, in a raise some 1,800 ft. upstream from their former workings. The new cross-cut leaves the old El Dorado tunnel near where the Sharp Stick channel was discovered. At the upper end of the Big Lead the gravel pays well, but as they are working downstream mining is proceeding at a disadvantage. Dave Ray, the superintendent at the mine, has 14 men at work. This mine is about 1,700 ft. above where the north fork joins the middle fork of American river, and has a good dump. The gravel at the mine is fairly free from cement, but as a precaution Mr. Ray has arranged a series of drops in the sluices and consequently the loss in the tailing is quite low. As yet no rare minerals have been found in the black sand from this gravel.—At the Rubelin group, a quartz property in Last Chance ravine, about one mile below the town, the drift on the lode is in about 40 ft. The vein has an 18-in. streak of ribboned quartz which assays \$10 per ton. The ore carries some galena and pyrite with scattered specks of free gold. It is intended to install a 2-stamp mill soon. This drift on the vein will give a good back of ore. The vein is said to have been traced for over two miles.—At the Home Ticket drift mine on the same channel as the Placer Gravel company 12 men are blocking out the gravel. The gravel in this mine is cemented and so will require crushing.—The Deadwood Drift property is not working at present owing to the litigation on account of which it has been shut down for several years. The Hazzard drift mine on the Turkey Hill channel is also shut down for the same cause.—George Wingfield has failed to make the payment on the Queen mine which recently became due. The owners, Savage & Warden, will work it themselves.—At the Herman mine, where the old 10-stamp mill has been started, but owing mainly to the distance of the mine from the railroad, trouble is being had in getting miners.

East Auburn, Oct. 9.

Much prospecting has been done on the Upper Forest Hill Divide this season. Several quartz veins have been discovered and the developments are quite encouraging.—It is reported that the upper 'lead' has been discovered

at the El Dorado gravel mine at Last Chance. The lower pay has been worked for 4,000 ft. along the channel. After long prospecting the upper pay was discovered in a raise 1,600 ft. from the mouth of the tunnel.

Reports have reached here from Australia concerning Francis P. Bray, who was well known in local mining circles. According to these reports, he has made a good record for himself in managing the Peters' Gully mine at South Heathcote, Victoria.

SHASTA COUNTY.

The Noble Electric Steel Co. has let a contract for the first unit of a battery of 12 charcoal furnaces. The by-products will be saved and the proceeds from their sale will materially decrease the cost of the charcoal to the company. The sample consignment to the Union Iron Works of electrically smelted pig iron made at Heroult was pronounced the finest pig iron ever received by that company.

SIERRA COUNTY.

The well-known Keystone mine near Sierra City, where the buildings were swept away last winter by a snowslide, has been leased to several miners who formerly worked at the mine. They intend to repair the 10-stamp mill and

the quartz belt that runs through the China gulch basin. Osgood & Wintering are the owners of the property.—Milton Dunphy and Roy Vincent are developing the White Swan and neighboring claims near Sawyers Bar. They have opened a vein of free-milling ore that promises well.—E. H. Scott has bonded the Corson & Kradle and the Gardner properties at Oro Fino. The ore is of good grade but requires cyaniding.—At the Home group of mines near Sisson a copper vein is being prospected in the north drift of tunnel No. 3, while in the west cross-cut the blue-quartz vein has not been reached as yet.

TUOLUMNE COUNTY.

The Spring Gulch mine will resume work this week but, owing to the supply of wood being small, only a few men will be employed until the power line from the Tuolumne Electric Co. plant can be stretched. This will be completed within 90 days. A new mill is to be erected at the mine and a cross-cut is being started on the 600-ft. level to catch the rich ore-shoot recently found on the 300-ft. level.

COLORADO.

CLEAR CREEK COUNTY.

(Special Correspondence).—A 2-ft. vein of smelting ore running 20% copper, and \$5 in gold and silver, has been struck 700 ft. from the entrance of the fifth level in the Santiago. The drift will be run 100 ft. farther, at which point stopping will commence. An aerial tramway is being built from the fifth level to a point above the Wilcox tunnel to facilitate the shipment of ore.

The Maud S. mine on Douglas Mtn. is making heavy shipments of ore running 70 oz. silver per ton.—The Beyers lease on the Zero tunnel is shipping silver-lead ore running \$100 per ton. A 9-in. vein is being developed.—A rich vein of silver-bearing ore has been struck in a blind drift on the Aster. The streak is 11 in. wide, and runs 3,000 oz. silver per ton. A 3-ft. body of ore running 330 oz. silver is being developed. The mine is worked under a lease by Butts & Co.—A rich vein of silver ore 16 in. wide is being developed on the Seven-Thirty through the Hercules tunnel.—Work has started on the 100-ton mill of the Capital Co.—The Boston mine is shipping 30 tons per week to the smelter. A 3-ft. vein carrying silver and lead is being developed in the upper



begin to mine as soon as possible. The mine was paying well when the snowslide occurred; a good pay-shoot is in sight.

Arrangements have been made to push development on the property owned by the Sierra Gold & Copper Mining Co. at Purdy's station. There are four or five parallel veins in this group of claims, all of which show up well at surface. Rich ore has been found in several claims in the district and the camp as a whole is looking well. Prospecting, which has been done this summer between the Purdy and Loyalton districts, indicates that the latter is the eastern extension of the Loyalton mineral zone.

SISKIYOU COUNTY.

The Humboldt Siskiyou Mining Co. was recently organized to operate a prominent group of quartz claims near Callahan. The main vein is about 3 ft. wide, with numerous rich stringers. Development has exposed much good ore near the surface. A 10-stamp mill has been ordered and the site is being graded. H. Hersey is superintendent.—Rich ore has been found in the lower level of the Ten Lakes copper mine near Edgewood, which is operated by the Osborne brothers. The lode is several feet wide and in places is quite rich. Considerable development work is being done and several of the veins have been stripped for quite a distance. The latest strike is said to be the most important discovery made in the mine.—The quartz ore recently found on the ridge between South Russian and Apple Sauce gulches, in Liberty district, appears to be a continuation of

workings.—A 9-ft. lode running \$50 per ton in gold and silver has been struck in the Collin mine on Young Mtn. in the Atlantic district. The strike was made 175 ft. from the portal of the adit. The shoot has been opened for 60 ft.—A 4-ft. vein rich in lead has been struck in the east drift on the Flossie vein, in the Vidler tunnel.—At several points in the Tobin mine, silver telluride has been encountered. Eight leases are operating on the mine in good ore. Shipments are being made to the Denver smelters.—An 8-in. streak of silver-lead ore running \$50 per ton has been struck in the Mendham mine in East Argentine. W. S. Graves is operating the property under lease.—The new mill of the Ramsdell Co. is completed, and will soon be running.—The Honest John tunnel will be driven several hundred feet, with the expectation of cutting several veins and opening up virgin territory. On the Delaware lode, recently intersected by the tunnel, much development is under way.—A body of smelting ore has been struck in the east drift on the Aetna vein.

Georgetown, Oct. 3.

OURAY COUNTY.

(Special Correspondence).—Walter Bunce, manager for the Chipeta Tunnel Co., started work about one year ago in his tunnel to find the American Nettie ore-shoot. A few days ago he encountered what he believes to be it, beyond the fault. How the ore turns out remains to be seen, although the strike is of considerable importance. The tunnel which he started one year ago is 8 by 8 ft., and over

2,500 ft. long. The first 2,000 ft. was made in six months. An average of 341 ft. was made for five consecutive months, which it is believed to be as rapid work as has ever been done in Colorado. Two shifts were employed to do the work. No timbering was necessary, except at the portal. Ingersoll drills are used. Only one angle has been made, and that on account of ownership territory, and this angle was 1,500 ft. from the portal.—One mile from town, the Mineral Farm is producing about 60 tons of concentrate per month with 10 stamps. Another 10 stamps is being put in order, and B. H. Du Praw, the superintendent, hopes to increase the shipments to 120 tons inside of 60 days. The adit is 300 ft. long, and a shaft from the adit level is down 180 ft. Ore is coming from the shaft, and some crude ore is shipped to the smelters. Temple-Ingersoll drills are used for driving and development work, and Sinclair and Waugh drills for stoping. Electric power is used in the mill and mine. On account of the scarcity of water they are obliged to pump it up and use it over again.—The Thistledown M. & M. Co. is operating one shift while waiting for the compressor and drills which will be installed in the next 30 to 60 days. A 3,000-ft. adit has been run and an 800-ft. raise is being made to the ore opened in the upper workings. About 200 ft. has already been made in the raise, and when machinery is installed work will be pushed as rapidly as possible. It is understood a mill will be erected below the adit level when more development work has been done. M. L. Thistle is manager.—Some of the operators in the district report a scarcity of good hammermen, but machine men are plentiful. A number of men have recently come in from Butte and other copper camps, which has materially changed the situation here regarding shortage of miners.

• Ouray, Oct. 5.

SAN MIGUEL COUNTY.

(Special Correspondence).—Some time ago the Pandora Co. began to work the lease which they had secured from the Smuggler-Union Co. on the Pandora vein in Smuggler ground. They are taking out 80 tons per day, which is sent to the Pennsylvania tunnel, where it is transferred from the Jigback tramway to the Smuggler tram and sent to the old Smuggler mill at Pandora. There it goes to the 20 stamps that the company leased. The first-class concentrate averages \$175 and the second grade \$125 per ton. The saving from the plates and Pierce amalgamators pays all running expenses of mine and mill. The company is mining some shipping ore which averages $3\frac{1}{2}$ oz. gold and 160 oz. silver. Two per cent monthly dividends are being paid. The company also has a bond on adjoining property, which they will undoubtedly take up if they are unable to get the lease extended when it expires next July. Thirty men are employed on the property. The company has leased the old Valley View boarding-house which adjoins the Pandora property. W. F. Smith is manager.

Telluride, Oct. 2.

TELLER COUNTY.

Good progress is reported by William Bainbridge, the superintendent for the tunnel company in sinking the intermediate shaft. This is to be sunk to a depth of 1,000 ft.—The large Crane washer at the Cresson was started last week, when the mine resumed operations.—A new body of ore is reported to have been found at a depth of 145 ft. in the Lucky Corner claim on Gold hill. It is also reported that a four-inch seam of rich ore has been struck on the 800-ft. level of the Granite property on Battle Mtn.—It is reported that the ore below the 1,000-ft. level of the No. 2 shaft of the Portland company is fully as rich, if not richer, than the ore above. The No. 2 shaft is now 1,265 ft. deep, and will be sunk to 1,500 ft. where a station is to be cut.—The Portland company has declared a \$120,000 dividend, payable Oct. 15.

IDAHO.

ELMORE COUNTY.

The Atlanta mining district, 80 miles from Mountain Home, is the scene of considerable mining activity. The Franklin mine and mill at Pine are producing, under the charge of C. L. Hopkins. The property is owned by R. P.

Chattin. The Atlanta mines, comprising the Buffalo, Last Chance, and Monarch, are owned by T. N. Barnsdall, of Pittsburg. Dan Kirby is in charge, and in five years, 10,000 ft. of work has been done, including a 625-ft. vertical shaft, and a 900-ft. drift on the 600 level. The Last Chance mine is on a different vein, and is connected with the mill by a $1\frac{1}{4}$ -mile Bleichert tram. The new mill, which will have a capacity of 150 tons per day, will treat ore by amalgamation, concentration, and cyanidation, and was designed by F. W. Sherman, of Salt Lake. Water power, applied to two De Reymer wheels, will operate the mill, and a 100-hp. electric motor has been installed. W. E. Gracey is the mine superintendent.—The Petit group covers a continuation of the Monarch lode, and belongs to the Bagdad-Chase company, of California, for which Wayne Darlington is the manager. A good deal of ground has been opened and a 20-stamp mill is being erected, the ore to come over a half-mile aerial tramway. A power-plant is being built two miles from the mill. C. S. Stevens is mine superintendent.—The Tahoma mine, in Quartz gulch, is owned by C. W. Miller, of Pennsylvania. It has been idle for years, but will be worked again. Drifts aggregating a mile in length are open, and an old 10-stamp mill is standing.—In the Minerva mine, 3,000 ft. of workings stand open, and a 10-stamp mill is running steadily, being operated by steam-power. W. F. Oden is superintendent, and Ogden Brown manager.—The Big Lode and Jessie Benton, both having mills, and situated in Quartz gulch, are idle.—Across the river from Atlanta, the Bonanza M. & I. Co. is operating a placer property, in charge of L. N. Franke. There is a 750-ft. bedrock sluice, and two plants are working on 15c. ground.

SHOSHONE COUNTY.

(Special Correspondence).—News comes of a strike of a shoot of galena on the 2,200-ft. level of the Tiger-Poorman mine at Burke, which was closed by the Federal M. & S. Co. several weeks ago, and the breaking into of a wide vein of silver-lead ore on the 900-ft. level of the Hecla mine, across the gulch from the Tiger-Poorman. Reports from Burke are that the bottom of the shaft of the Poorman mine is in ore and that it is purposed sinking it 200 ft. A large force of men is at work in the mine.—Arrangements have been made with the management of the old Bull Pen mine, known as the Independence property, adjoining the Copper King, Missoula Copper, and National Copper properties, whereby the 1,000-ft. tunnel driven and abandoned by that company, has been leased to owners of the Missoula Copper Co. to drive an extension 600 ft., cutting the Missoula Copper Co.'s orebody at a vertical depth of 800 ft., or 500 ft. below the present workings. The concern has a capitalization of \$1,500,000. A compressor will be installed on the Missoula ground, and 150 ft. per month will be driven with the new equipment. Several stringers of copper have been cut and reports are that the orebody has been encountered at depth, and some ore in the cross-cut averages 4% copper, while stringers have been found that assay higher.—Reports issued by W. D. Greenough, manager of the Snowstorm Mining Co. at Mullan, show the net earnings of the mine for the fiscal year were \$498,013. Dividends paid to stockholders amounted to \$359,910, leaving a surplus in the treasury for the year of \$91,625. Estimates of the value of ore in transit is \$135,055. During the year the mine produced 87,503 tons of ore, of which 77,782 tons were shipped directly to the smelters and 9,721 tons milled at the mine. Extensive improvements, including a tramway of 5,800 ft., connecting No. 3 tunnel with the railroad, and compressor, power, and lighting plants have been installed. To meet the growing needs of the mine an additional 300-hp. compressor and motor have been ordered.—Stockholders of the Senator Stewart Mining Co. at the annual meeting at Kellogg, elected these directors: C. R. Leonard, N. W. Bacon, Butte; E. J. Carter, Spokane; B. F. O'Neil, Wallace, and Stanley Gifford, New York. Leonard and Bacon are president and secretary. The Senator Stewart is two miles from Wardner. Regular shipments will begin as soon as a railroad spur to the property is completed.—The 124th consecutive monthly dividend of \$180,000 by the Bunker Hill & Sullivan mine has been declared. The payment

brings the amount paid to stockholders since January 1, 1907, to \$1,620,000, and the total dividend paid to date \$9,486,000. The Snowstorm Mining Co. has also declared its monthly dividend of three cents per share, or \$45,000. This brings the total for the year to \$360,000, and the total to date to \$450,000, the company having paid a \$90,000 dividend a year ago.

Spokane, Oct. 4.

WASHINGTON COUNTY.

Considerable interest is being shown in the kaolin deposit recently discovered eight miles from Idaho Falls. The deposit is said to be eight feet wide and can be traced for over a mile. The kaolin is said to be quite free from grit. Tests of its pottery properties are being made.

NEVADA.

CHURCHILL COUNTY.

(Special Correspondence).—Fifteen lessees are working in the new camp of Rawhide, 45 miles south of Fallon and 40 miles east of Schurtz, and ore running as high as \$8,300 per ton has been taken out. Another lessee has an 8-ft. vein which pans gold, and a 12-in. streak which assays \$238. The mineral belt is at least five miles long by three wide and the formation is very similar to that of Goldfield, the general character being eruptive rocks, principally rhyolite, andesite, dacite, and porphyry, often capped by a Malapai of later origin. About five miles to the north is a belt of stratified rocks, including schist, slate, and limestone. A townsite has been formed and between 200 and 300 prospectors are at present here, and a number of business places.

Rawhide, Oct. 7.

(Special Correspondence).—The Eagle's Nest property has been the scene of another wonderful strike, a good body of \$400 ore having been opened in the drift from the 100-ft. level.—The strike was made by the Eagle's Nest Mining & Leasing Co., locally known as the Davis lease. Work was started less than a month ago, and owing to well-advised development rich ore was struck almost immediately. Sacks have been ordered and will soon be on the ground. A complete hoisting plant, purchased in Fairview, will be installed.—This strike has demonstrated the continuity of the rich Fairview Eagle vein; consequently leases on the Eagle's Nest and the Hailstone properties are urgently sought. The outcrop is traceable into Hailstone ground, and with proper development, the rich silver sulphide ore should be opened there also.—This part of the Fairview district is coming to the front, as the Nevada Hills, Eagle, Eagle's Nest, Dromedary Hump, and Golden Boulder are in rich ore, and are sacking it for shipment.—The Nevada Hills is the pride of the camp. It is estimated that over \$5,000,000 of ore is now blocked out in the different workings. Most of this is of a shipping grade. About 50 men are employed in the Nevada Hills, and more are added as fast as places can be made for them. The new railroad, arrangements for which are practically completed, will be built right up to the loading station.—The Jarvis lease on the Fairview Eagle is daily sacking ore, some of which will assay \$1,000 per ton, while the main company workings are being opened to good advantage.—The producing area of the Fairview district is fast expanding, and rich ore has been found for a distance of about seven or eight miles. At the extreme northern end of the district, and out in the flat, is the Hot Onion group. High-grade ore has been found on this property, and shipments are regularly being made, while fully seven miles to the south of the Hot Onion some high-grade ore has been found on the Gold Crown, the Nevada Fairview, and the Nevada Condors properties.—The camp generally is picking up rapidly. The railroad from Fallon, the electric lighting and trolley system are in prospect, and preparations are being made for an active fall and winter.

Fairview, Oct. 8.

HUMBOLDT COUNTY.

(Special Correspondence).—The Brown Palace is developing into one of the richest properties in this county, and the mine is a steady shipper. It is said that the ore assays well in gold and silver.—The main shaft at the Dream-

land is down 100 ft. and some ore is being developed. Shipments will be deferred until the Western Pacific railroad reaches this property.—Several shafts and tunnels are being driven to develop the orebodies in the Golden Triangle, but no shipments will be made until the railroad is completed.—A vein is being developed in the Big Six, and the shaft is going down rapidly.—A 20-ft. low-grade vein has been struck in the main tunnel of the Springfield. The strike was made near the surface.—Some ore is being opened in the shaft at the Durango Girl. The shaft is going down, with driving on the vein.—It is said that a rich strike has been made at a depth of 400 ft. in the Seven Troughs.—A strike is reported from the Fairview.—A body of sulphide ore has been struck in the 212-ft. level in the Buckhorn, so the shaft will be sunk deeper.—Excellent ore is being taken from the vein in the Kindergarten, and the mine is showing up well. Development is under way and a reserve of milling ore is being blocked out. Some shipping ore has been sacked.—Another strike is reported to have been made in the main shaft of the Mazuma Hills.

Rosebud, Oct. 7.

NYE COUNTY.

The Shoshone mill, though running continuously, is working two shifts, but this week three shifts have been put on at the Tramp mill. Good shipping ore is being mined in the south drift on the 200-ft. level on the Tramp vein, where three shifts of miners are being worked. The smelter returns from a 23-ton shipment of high-grade ore from the National Bank mine gives an average of \$485 per ton. The underground development is quite encouraging as considerable good milling ore is being found. The company intends to equip the mine with 2½-in. Ingersoll-Sergeant drills. The Mayflower mine is showing up well on the 400-ft. level. It is announced that the Clark road will be completed to Goldfield by the middle of the month.

OREGON.

JOSEPHINE COUNTY.

The Rogue River M. & D. Co. is preparing to put in a long flume for the winter's run on its placer property on the Rogue river, at Blossom Bar, Paradise Bar, and Little Tommie East creeks. Edwin J. Porteous is the superintendent.—A good winter's run is expected at the placer property of the Swastika Mining Co., of which A. C. Howland is the manager.

WASHINGTON.

SHOSHONE COUNTY.

(Special Correspondence).—The case of Jonathan Bourne, Jr., owner of the Ontario mine, v. the Sierra Nevada Mining Co., was heard by Judge Wood of the District Court at Wallace last week. The case involved a question of extralateral rights. The hearing attracted much interest, as it appeared to be virtually a controversy between the Bunker Hill & Sullivan Mining & Concentrating Co. on behalf of the plaintiff and the Federal Mining & Smelting Co. on the side of the defendant. The interest was further intensified by the prominence of those who gave expert testimony, among whom were F. L. Sizer and W. F. Word of Helena, H. V. Winchell of St. Paul, W. H. Wiley of Los Angeles, J. R. Finlay of New York, and N. E. Linsley of Spokane. A mine model was produced in court, as well as elaborate maps, to make plain the surface boundaries, the extent of the workings, and the position of the orebodies. Stanly A. Easton, manager for the Bunker Hill Co., and W. Clayton Miller, manager for the Federal Co., were in attendance.—Considerable development has been done this year at the Stanley mine, which is near the Hercules mine at Burke. On the lower levels high-grade stibnite has been found. The ore is quite clean and also carries some silver and gold. Parties from Galena, Ill., have been examining this mine, and three carloads of the stibnite have been shipped to that point. It is claimed that the ore carries as high as 70% antimony. The property is being developed by the owners, among them being M. J. Farrell, H. J. Rossi of Wallace, and W. W. Merk of Spokane.

Wallace, Oct. 7.

Special Correspondence.

Denver, Colorado.

Tunnels or Adits.—The Daily Press and Gas.—General Mining Activity. — Humor in Journalism, Especially at Colorado Springs.

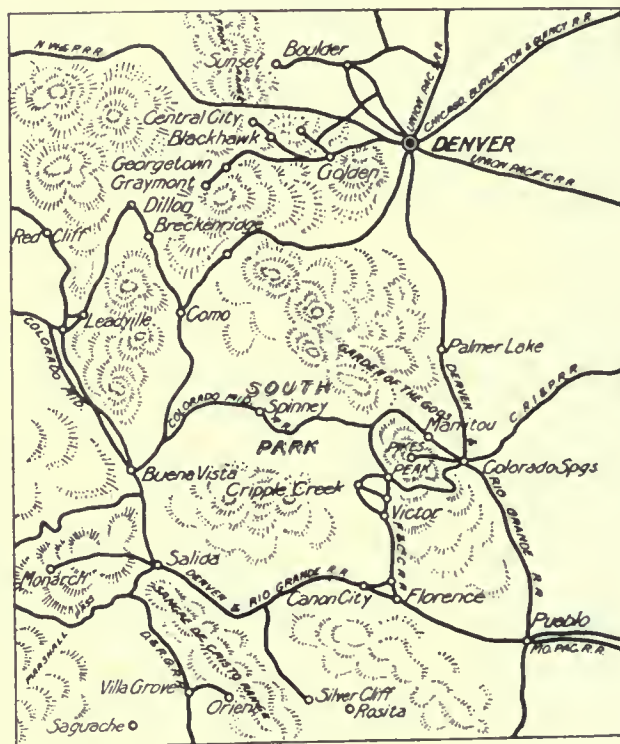
Possibly the squeeze in stocks has attracted attention to the water question. Certainly tunnels have evoked an unusual amount of interest lately. At Idaho Springs a contract has just been let to drive an adit 4,000 ft. from the mouth of Trail creek to unwater the workings of the Metropolitan, which has so far labored under unfavorable drainage conditions. The Honest John Co., at Georgetown, also announced its intention to extend their adit to a distance not yet determined. At Red Mountain the Joker tunnel has passed through the Guston and Yankee Girl workings and will soon reach the orebodies exposed in the Genesee workings. At Telluride it is reported that work on the Meldrum tunnel will soon be resumed, as negotiations with a syndicate for the prosecution of the work are well advanced. This last is a most ambitious undertaking, the attempt being to pierce directly through the divide from the head of the San Miguel to the Red Mountain side. The adit is being driven from both sides and has penetrated about 4,000 ft. of the total distance. In the course of the work some exceptionally promising veins have been cut, but no exploratory work on them has so far been done.

The daily press has found opportunity for the publication of a lot of rubbish following the incident of last week when several miners were temporarily imprisoned in some workings tributary to the Ophelia tunnel by an unusual development of the 'bad air,' so familiar to those operating in the Cripple Creek district. As is well known to all mining men, the rather porous rock of the crater is full of gases that appear like the last exhalations of the Cripple Creek volcano. These consist chiefly of nitrogen and at times, when the barometer is low on the surface, and the atmospheric pressure is correspondingly diminished, the gas comes pouring out of the wall-rock and frequently so fills the working places as to absolutely prevent entrance for the time being. The appearance and disappearance of the gas is most generally abrupt and frequently exhibits no visible connection with any apparent cause. The simple facts of the incident were that 23 miners, when at the end of their shift, descended from their working places to the adit-level, found the adit filled with gas that barred egress. They simply returned to the working places and waited until a rope could be let down an unused shaft so that they could be drawn up by a windlass, as waiting for the gas to disappear might involve too long a period for hungry men. This simple incident was magnified by the irresponsible journals that seem to find the bracing atmosphere of Colorado particularly suited to their development, into an exposure to deadly peril and a thrilling rescue. Seriously, however, the gas forms little more than an inconvenience to working in most of the few mines that are subject to it.

Development work throughout the State continues encouragingly active. At Young Mtn., near Georgetown, the recent find of petzite in the Tobin mine has caused not a little excitement, while the opening up of a good body of galena in the Boston mine on Democrat Mtn. promises to be no less remunerative, though it does not stimulate so much interest. Near Salida, an organized attempt is being made to develop the copper deposits on Cottonwood creek, which have been irregularly exploited from time to time. At White Pine, production is

active and several transfers have taken place that promise to stimulate it even further. At Breckenridge, the Senator mill has begun operations, while at Silverton work continues active in spite of the slight damper put on operations by the closing down of the local smelters of the Ross Mining & Milling Company.

Few towns of 35,000 inhabitants possess a comic paper that is genuinely funny. Colorado Springs has the unique distinction in a paper called the *Mining Investor*. In its editorial columns it has patronizingly attempted from time to time to point out the errors and shortcomings of the journalistic activities of such periodicals as the *MINING AND SCIENTIFIC PRESS* and *The Engineering and Mining Journal*, as seen from its standpoint. In a more recent issue it proceeds to demolish (as it fancies) *Collier's Weekly* for a series of articles relating to the adventures of an investor with little cash and less wisdom who attempted to acquire much cash, but gained wisdom instead. To any rational thinker the series of



A Part of Colorado.

articles appear to be eminently illuminating to a group of people whose participation in mining speculation is far from desirable. To the strabismic vision of the *Mining Investor* it appears an attack on the legitimacy of the mining industry. With rare and unparalleled humor it follows its remarks on the subject with a full-page advertisement of an enterprise the chief assets of which consist of an excellent press agent and unlimited audacity; follows it by a half-page of another that is offering shares by the million at 10c. each with the assurance that they will go to 25c. by the end of the year; and most appropriately concludes its remarks by a tail-piece consisting of the advertisement of a similar periodical where with each year's subscription at \$1 one may secure 50 shares of the Bootlace (or something like that) Mining Co. with the full assurance that they will pay a dividend soon. When to stimulating the activities of a moribund mining stock exchange and to painting 10-ft. prospect holes into a glittering blaze of glory equal to that of a dividend-payer, are added a general oversight of national journalism, the ambitious individual is apt to find himself in the case of the drunken man in the bar-room who successively challenged to fight any man in the room, in the

county, and in the State; and regretfully concluded a few minutes later that he had attempted to cover too much territory.

Mexico City.

Progress at Guanajuato.—The Porfirio Diaz Tunnel.—The MacDonalds.—George Bryant and His Useful Work.—The Pinguico.

The message of Governor Obregon to the legislature of the State of Guanajuato at its opening session recently was a noteworthy communication in calling general attention to the remarkable progress at Guanajuato during the last few years. The Governor stated that the large companies now operating in the camp represented a capital of over P50,000,000, the greater part of which had been expended in equipment and development work; that these companies now had a weekly payroll of

the regeneration of this famous old camp of Guanajuato. Now the Sirena, after spending some \$200,000 in development work, is producing 300 tons per day, the mine and mill being in charge of still another brother, Joseph MacDonald. The MacDonalds also have charge of operations at El Carmen, located by M. E. MacDonald, and the first to attract special interest to the cross-veins of the Mother Lode, Los Cordones near El Cedro, and La Barragona near El Monte de San Nicolas. Next to the MacDonalds, the present prominence of Guanajuato is perhaps due, more than to any other one man, to George W. Bryant of the Guanajuato Development Co. The beginning of his success dates from the time, just six years ago, when he first interested Frank G. Peck and Colorado Springs capital in his Guanajuato schemes and got work started at the Peregrina, which is now a steady



Map of Mexico.

P150,000; and that all people in the city could banish fear in the knowledge that the great Porfirio Diaz tunnel would probably be completed by the last of January next, or at least before the coming of the next rainy season. Only those who have watched the progress of Guanajuato during the short years of this present century and seen the death and destruction wrought by the two most recent floods in these last five years can know what these things mean. The Porfirio Diaz tunnel will catch the waters of the rainy season well up the gulch in which the city of Guanajuato lies, and lead the devastating flood around and past the city to the valley below, assuring the future safety of the community. Six years ago the only property in this old silver camp that was producing a sufficient quantity of ore to be worthy of consideration was the Sirena of the Guanajuato Consolidated Mining & Milling Co., which with a small battery of 20 stamps and amalgamating pans was making a very creditable showing under the management of M. E. MacDonald. But not fully satisfied with the results of amalgamation, experiments were even then being carried on with cyanidation, and these were finally worked up to a successful issue by Bernard MacDonald, a brother of the former, and to his work with the cyanide process is due

producer. He has never been able to interest sufficient capital in his dredge scheme in the Guanajuato river to carry it through, and the enterprise has now been indefinitely laid aside. After getting the Peregrina started, Mr. Bryant got options on the Valenciana, Cata, Rayas, and Mellado, the most famous old properties on the Mother Lode and turned them over to the Guanajuato Reduction & Mines Co., which has 160 stamps dropping and promises soon to double that number; is unwatering the old mines comprising practically all the old and ancient workings of Guanajuato, and in addition to the ore from the upper portion of these workings, is treating 500 tons per day from the old dumps, which are variously estimated to contain from one to three million tons on the old Valenciana and another one or two millions on the Rayas and Mellado. Mr. Bryant then took up the Nayal, several miles southeast from Guanajuato, which some years before had been abandoned by Dwight Furness because of the vein pinching and the work being no longer profitable under the methods then in vogue, but Mr. Bryant's lamp seemed to respond to the rubbing and the Nayal is on his producing list. About this time Mr. Bryant organized the Guanajuato Development Co. and started work on the Pinguico, which is situated on

the same cross-vein as El Carmen and the phenomenal richness of the orebodies found therein have been heralded throughout the Republic. It has been as the crowning jewel to this man's work for and faith in Guanajuato. The mill for the treatment of the ores—a model of its kind—is just about completed. The mill consists of two units (a crusher, 20 stamps, and Chilean mill) of 100 tons each; an aerial tram runs from the mine, half a mile away, to the crushers (9 by 15 in.), a drop of 90 ft., thence to the stamps, each weighing 1,000 lb. and dropping 5 in. with 100 blows per minute; the coarser than 30-mesh goes to the Chilean mills and then all to Wilfley tables, whence the tailing goes to the cyanide vats. Assays in both the Pinguico and Carmen have shown almost conclusively that gold may be looked for in the cross-veins in the Guanajuato district in distinction from the ores in the Veta Madre wherein silver predominates. The Pinguico mill is completely equipped with electric power furnished by the Guanajuato Light & Power Company.

Butte, Montana.

Decrease in Production.—Question of Lower Wages.—The Barnes-King Fiasco.—John Gillie's Report.—A Wretched Affair.—Other Poor Schemes.—Work Stopped at the Stewart.

Officials of the companies concerned say that during the past week the curtailment of production by the Amalgamated, North Butte, and Butte Coalition companies reached about 75% of the normal; in other words, the output has been just a fourth of what it was last June. The reduction in the number of men employed has been corresponding, and instead of 10,500 miners there have been working during the past week not to exceed 2,500 men in the Butte mines. The companies are still mining the same grade of ore that was taken out before the orders for a curtailment were given, and, due to that and the reduced production, the cost of operating has been considerably advanced, some estimates placing the cost at 14c. per lb. It seems unlikely that such a condition can be continued very long, and it is anticipated that unless there is a speedy and material improvement in the metal market an entire suspension of operations in the Butte district will be ordered.

No action has yet been taken by the mining companies looking toward a reduction of wages of miners, although according to the terms of the contracts entered into some months ago the men are due to return to the old scale of \$3.50 per day. They were granted \$4 per day under an agreement that the old scale should be resumed if the price of copper should fall below 18 cents per pound and remain below it for 30 days. The companies have not yet taken advantage of the contracts, but have sent written notices to the Miners' Union that in view of the unsettled condition of the copper market the companies would not reduce the wages at the present time. It is understood that these notices were sent so that the companies would not waive their legal rights under the contracts by failure to enforce them. Similar notices were sent by the Amalgamated companies, North Butte, Butte Coalition, and the W. A. Clark company.

The Barnes-King Development Co. fiasco, the character of which has been disclosed by a report made to stockholders by John Gillie and the new board of directors, is really the first actual wild cat and mining fraud that has come out of the scores of new concerns that have been organized for operation in Montana. After an exhaustive examination of the mines of the company in Fergus county the president, John Gillie, and the vice-president, C. W. Goodale, find that the company has probably \$50,000 worth of ore in sight, for which the

stockholders paid \$2,000,000, the amount of the company's capitalization, and even that body of ore has been found since the new company took over the property, so that in the opinion of the new officers the property practically had no value when it was capitalized for \$2,000,000. It is stated that the experts who examined the property for the promoters were Will Word, of Helena, formerly an Amalgamated engineer; Walter Harvey Weed, formerly connected with the Geological Survey, and R. B. Lamb, a mining engineer well known in the West. The Word report was especially flattering to the property, as it accounted for a vast tonnage in sight, figured out tremendous values and profits, and extremely low cost of mining and milling. What was contained in the Weed report is not known as it was never made public in its entirety, and Mr. Gillie has been unable to get possession of the original. Only extracts from the Weed report have been given out, and they are very favorable to the property. John C. Lalor, manager of the Marcus Daly estate, and one of the promoters, was elected first president of the new company and he continued to give out the most glowingly optimistic reports of progress and wealth of the mine, coupled with promises of early and continuous dividends. R. B. Lamb was retained as general manager of the mine, and operations were directed by Superintendent Brule. Very favorable reports came constantly from the mine until the new board of directors was elected in August, and then the resignations of Lamb and Brule were requested and the new officers made the examination of the property, finding that the mines had been worked out before they were turned over to the new company. Mr. Gillie finds that the stockholders were not only defrauded in the first instance but that after the organization of the company its affairs were shamefully mismanaged. An immense amount of useless machinery was purchased, "enough to run the Anaconda mines," as Mr. Gillie says. A shaft was sunk at the most inappropriate place, and poor judgment was used in doing development work. A lot of money was spent in erecting a saw-mill many miles from the mine and in sawing a lot of lumber that can never be used by the company. The chief promoters appear to have been the late A. J. Campbell, attorney for the Daly estate, and John C. Lalor, manager of the same estate. Because of the prominence of the name of Daly and the close association of the promoters with leading officials of the Amalgamated Co., the Barnes-King proposition gathered a great and influential following. W. W. Cheely, who represented the promoters in Butte and took the Butte subscriptions, had great faith in the reports of the experts and the judgment of Campbell and Lalor, and is now himself a ruined man because of the investments he made in Barnes-King stock. The promoters claim they paid \$1,200,000 to E. W. King and his associates for the property, but it is known that an option of \$400,000 on the property was turned down by others. The promoters gave the new company the property acquired and a treasury of \$400,000 in exchange for the \$2,000,000. The treasury still contains about \$260,000, which is to be used for development purposes in the hope that another orebody will be found. The mines did not pay expenses for some time before they were turned over to the new company, as the latter discovered when it assumed control and had to pay an overdraft at a bank for \$24,700. Some of the most experienced mining men and the most astute bankers in Butte were taken in on the Barnes-King proposition and lost hundreds of thousands of dollars. It is estimated that nearly \$1,500,000 was taken out of Butte by the apparent swindle. Mr. Gillie says that if \$100,000 had been paid for the property it would have been a high price. Some of the stock-

holders are preparing to institute suit against the persons who are supposed to have benefited by the alleged fraud, and others are threatening to ask for the appointment of a receiver.

There have been few failures among the scores of new mining companies that have been organized to operate in the Butte district during the past two years, but there have been none that can be regarded as absolute frauds or wild cats, though several have been the causes of great loss to investors and have been the subject of severe criticism. The first of these was the Butte Copper Exploration Co., promoted by well known Boston bankers and brokers; the public purchased stock under the belief that the company owned the property it was attempting to develop, but which it only held under bonds and these were allowed to lapse after insufficient work had been done and the treasury exhausted. Another wretched scheme was the Butte Copper Co., the promoters of which did much like the Barnes-King promoters, in that they took in all their friends and sold them all the stock they could. The similarity ended there, however, for after the sale of quantities of stock in Butte the Butte Copper men went to New York and organized a new company on the majority of the stock in the old company, which so discredited the old stock that it has been worthless on the market ever since. This company has also ceased operations, and the stockholders count their money as lost. With few exceptions, all the other companies organized during the height of the copper boom are still working, and a number of them have good chances to develop producing mines.

All work at the Stewart mine in the Cœur d'Alene, owned by F. A. Heinze, has been stopped. The reason for the suspension is not known, but is presumed to be in the fact that the property on which the Stewart mill is situated has become involved in litigation. The mill is on the Silver King lode, adjoining the Stewart, and the Silver King is owned by the Cœur d'Alene Development Co., with which Heinze is in litigation.

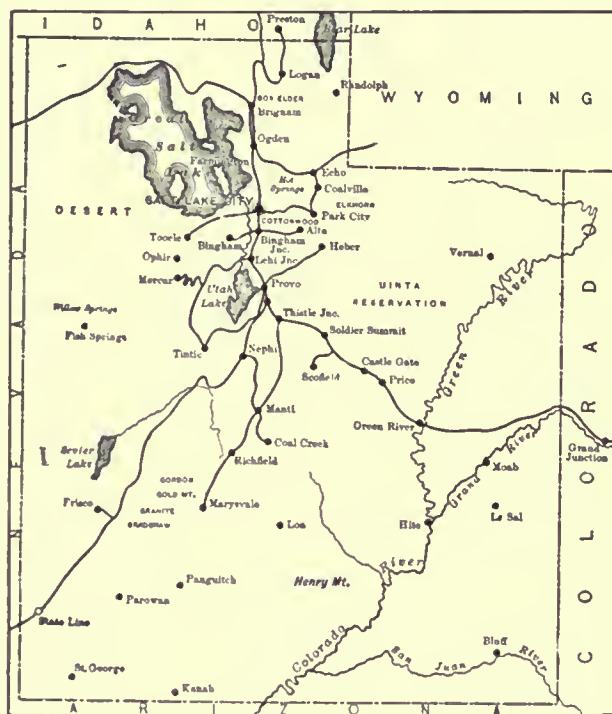
Salt Lake, Utah.

Decrease in Copper Production.—General Curtailment.—Lead Output.—The Deepest Shaft.—Shipments From Park City.—Utah-Apex.

The copper mines of Utah have begun curtailing their output. As a result of this, there has been a marked falling off in the demand for labor at the mines and smelters. This slowing down process began at Bingham, where more than a thousand less men are employed than was the case three weeks ago. The first of the big copper companies to decrease the working force was the Boston Consolidated where 300 men were dropped from the payrolls; then the United States Co. shut down its Telegraph mine and practically stopped work at the Galena mine; the Bingham Consolidated fell into line and ceased production at its Commercial mine and a few days ago the Tintic Mining & Development Co. closed the Yampa mine and smelter indefinitely. While the lowering of the price of copper has been an element contributing to this situation, there have been other conditions confronting operators that have made it advisable to ease off at this time. The difficulties experienced in the matter of railroad transport, the shortage of fuel due largely to the inability of the common carriers to meet the demands of consumers, unreasonable demands of labor, and the greatly increased cost of materials, machinery, supplies, and nearly every other thing required in the operation of mining—these factors, in connection with the falling metal market, have caused a serious state of affairs calling for adjustment. It is claimed by operators and engineers that the cost of pro-

ducing copper from the leading mines of Bingham need not exceed 8 or 9 cents per pound under normal conditions; some of them can produce it for much less and this was demonstrated last year by the Utah Consolidated, which has a cost sheet showing the expense to have been a little under 5 cents per pound. The smelting companies operating lead furnaces in the Salt Lake valley have complained of a congestion of ore and have urged the producers to curtail production. Attention is also called to the fact that the time of year has arrived when there is less demand for lead; that like copper, the metal has fallen off in price lately and that a slowing down in production at this time might be the means of averting further depreciation. While no concerted action has been taken as yet, it is believed that many of the lead producers will comply with this request.

No effort has been made toward a settlement of the strike in the Daly West, Daly, and Ontario mines at Park City, and there is little indication that the companies involved contemplate making a change of front. The Little Bell mine, which is practically under the same



Utah.

management, has been shut down because of the agitation for recognition of the union.—The deepest shaft in the State of Utah is in the Tintic mining district and is on the property of the Mammoth Mining Co. It is down 2,300 ft. At this depth the company has encountered some immensely rich bodies of ore, running high in gold. The company is preparing to make a shipment of high-grade ore and it is likely that it will soon pay a dividend. The treasury has something over \$300,000 on hand.—Work in the Uintah Treasure Hill mine at Park City will be resumed in a few days. The shaft of the Creole property, now owned by the Treasure Hill Co., has been cleaned out and put in shape for operation.—The ore production from Park City last week amounted to 1,615 tons, the contributing mines and amounts being: Silver King Coalition, 1,030; Daly Judge, 537; Little Bell, 261; other properties, 22 tons.

The construction of the aerial tramway (12,000 ft. long) of the Tintic Mining & Development Co., at Bingham, is progressing and will be completed in about six weeks. Pending the shut-down of the Yampa mine and smelter, several new furnaces will

be installed at the latter so as to raise the capacity from 600 to 750 tons daily.—The Utah Apex mine is operating with the usual force and is sending ore to the Markham Gulch mill for treatment. The new manager, R. S. Oliver, who was promoted from the position of superintendent, has taken charge, relieving Walter C. Orem, who resigned to give his attention to the operation of the Nevada Douglas Copper Co.'s property at Yerington, Nevada.—The Horn Silver Mining Co. has paid another quarterly dividend of \$20,000. J. M. Ceballos, of New York, is to succeed the late Allan C. Washington as president of the company.

Cripple Creek, Colorado.

New Find in the Abe Lincoln.—A Tunneling Machine.—Promising Discoveries.—The C. O. D. Shaft.—Leases on Bull Hill.—The September Production.

A vein in new territory has been opened in the Abe Lincoln property. This property was recently acquired under lease by Jack Sharp. The vein contains a streak of calaverite varying from a knife blade to an inch in width; assays run into the thousands of dollars.—The plans for the new Trilby mill make it one of the most complete in the district and allow for 100 tons per day. The excavation is finished and the concrete foundation will be started in a few days.—Inventors of rotary tunneling machines are not discouraged by recent failures. Another machine is to be given a trial in the Hull City placer mine on Bull hill within a few days. This machine has 62 piston-drills, the operating principle of which is to chip the hard rock in the same manner as a chisel in the hands of a stone-cutter; the power of a 10-drill compressor is deemed sufficient to run it at full capacity. Fred Russell is the inventor and gave the machine a thorough test in a Denver shop, where it gave promise of success when put to practical use.

In conducting operations deeper than any yet undertaken on the Chicken Hawk property, a new vein has been encountered, which is believed to be an extension of the main Mary McKinney vein, as the ore is a quartz similar to that in the Mary McKinney. Additional interest is given to the find for the reason that it is in virgin territory and assays run from 2 to 4 oz. gold per ton.—Large quantities of low-grade ore are known to exist in the region south of Victor, about Trail Mtn., but no real development work has been undertaken until recently. The Northwestern Co. has installed a modern plant, operated by gasoline and electricity; three Fairbanks-Morse gasoline engines, with a total of 50 hp., operate a 15-kw. generator, which in turn runs the drills and furnishes light for surface and underground purposes. The main shaft is 150 ft. deep and has two compartments 4 by 4 ft. each; it is timbered and ready for installation of cages, which will be put in on the completion of 200 ft. more of sinking. The vein can be traced for a distance of two miles on the surface north and south of the shaft. The plant is also equipped with a complete cyanide mill; there are 4 solution-tanks with a capacity of 45 tons each. Iowa capital is behind the enterprise.

It is announced that the C. O. D. Leasing Co. will rebuild the C. O. D. shaft-house, recently destroyed by fire. A portion of the shaft for 75 or 100 ft. below the collar will need retimbering, and a new plant of machinery will be erected. It is intended to sink from the 900-ft. level to 1,000 ft. and cross-cut through unexplored territory. The C. O. D. mine is one of the old producers of the camp; previous to the fire ore was taken from the upper workings and it is for the purpose of cutting these orebodies at greater depth that the new work is planned.—A mud seam in a vein upon which the

Union Leasing Co. is operating on the Proper claim of the Stratton estate is giving high returns, though it is difficult to separate it from the rest of the ore broken, the width of which is 6 ft. The vein contains fluorite and shipments on an average of two carloads per week are made to the Portland mill at Colorado City.

A number of properties report new strikes. The Western Investment Co., operating on the 400-ft. level of the Morning Glory, is reported to have opened up an ore-shoot from which regular shipments are being made. The vein is 6 ft. between walls and assays from \$30 to \$60 per ton.—The Sitting Bull claim of the Keystone Co. on Bull hill has a new orebody exposed on the 250-ft. level in basalt.—W. J. Hill and associates, in doing development work on the 360-ft. level of the North Burns property, have encountered a new orebody, assays from which yield 5 to 6 oz. per ton; the width of the vein ranges from 7 in. to 3 ft.—The Joe Dandy property has a strike on the 250-ft. level 200 ft. north of the shaft; a vein 3 ft. wide contains a streak of sylvanite giving returns of 27 oz. per ton, and on either side of this streak the ore averages 2 and 3 ounces.

Considering that many of the large properties were short of men in the early part of the month, September exceeded expectations as regards production of ore. The cyanide plant of the Golden Cycle mill, which was not wholly destroyed by the fire, shows an increase in the amount of ore treated, and the Portland mill reports an increase of 1,000 tons; altogether the output was little under that of August. The local mills kept up to their capacity, showing that they are on a solid basis. The Vindicator Co.'s experimental plant has given great satisfaction and a larger mill is reported as assured. Many of the smaller mines closed down or sent their ore to local mills, thus reducing the receipts of the smelters. Following is a table of the tonnage and value of ore treated during September, from which it will be seen that the cyanide mills are steadily forging to the front:

Plants.	Tons.	Average per ton.	Total.
Golden Cycle	24,000	\$ 2.50	\$ 60,000
U. S. R. & R.	12,300	24.00	295,200
Portland	11,500	22.00	253,000
Smelters	4,900	54.00	264,600
Isabella	3,000	6.00	18,000
Ironclad	2,500	3.00	7,500
Phoenix	2,000	2.00	4,000
Vindicator	750	20.00	15,000
Smaller plants	2,000	10.00	20,000
Total	62,950		\$837,300

Pioche, Nevada.

Optimism Dominant.—Confident Outlook.—Nevada-Utah Co.—The New Railroad.—Bristol Con.—Boston & Pioche Co.—The Rights of Surveyors.

It would be hard to find in the West today a mining camp where a more pronounced feeling of optimism exists than in Pioche today. As the region of which Pioche is the commercial and distributing centre is going to produce large quantities of lead and copper, a natural inference would be that the recent depreciation of those metals and the fall in mining stocks would result in gloom here. Such is far from the case. Not a man whom I have interviewed during the past week has shown any evidence of mistrust or apprehension. Perhaps the most interesting fact is that the misfortunes of other camps are regarded here as the most encouraging incidents that have occurred since the contractor began work on the grade last spring.

There are many reasons for this. Calamity has been the portion of these people for a very long time, and deliverance is now close at hand. That is doubtless the

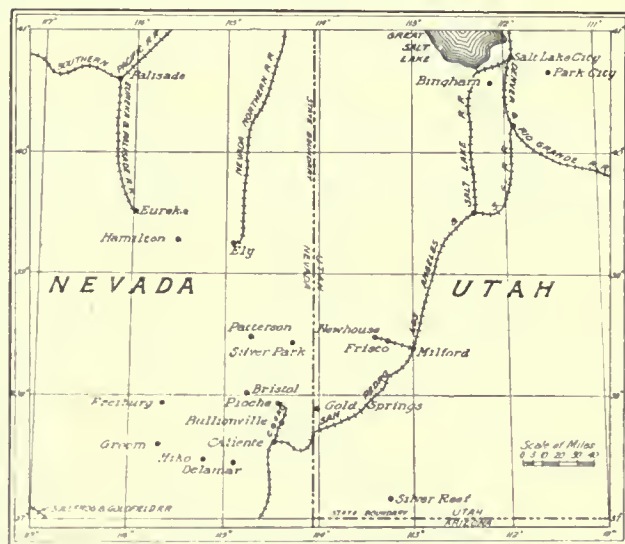
controlling reason. The man who has been living sumptuously and sees himself compelled to retrench and to accept plainer fare may regard the situation unhappily, but the man who has been starved and sees abundant food coming up is not at first likely to grumble if that food is not as choice as some people enjoy. Another reason is that people who look at things from a distance get a better perspective than those who are *in medias res*. In the large financial centres, where stocks are declining and the injured are groaning and exchanging condolences, the atmosphere of distress becomes general and optimism has hard sledding. In a place like this, far from the madding crowd, it is easier to analyze the situation and to realize convincingly that the country generally is prosperous, that seven billions of dollars is going to be soon let loose in return for abundant harvests, and that the need for lead and copper will be greater than it ever was. The law of supply and demand has not been overturned even if Wall Street did have a panic and some rash parties parted from paper profits. Silver and gold are stable and at present will afford the larger proportion of value from the ores of the region, and by the time we get properly started lead and copper should recover some of the price they have temporarily lost. Another reason which appeals to the mine manager here is that he sees better promise of a labor supply. Good miners have been scarce. There has been a disposition to grumble about wages and hints that the high-pressure conditions prevailing at Goldfield will soon be established here. Since the exodus began at Butte things have changed and there seems promise now that Pioche can have all the good miners she needs and that they will be content with fair wages.

Mr. Swanton, superintendent of the Nevada-Utah, told me last week that they are planning more extensive operations even than they contemplated thirty days ago, and actually seemed elated at the prospects rather than depressed because Nevada-Utah stock is just now in the doldrums. And so with Ohio-Kentucky. The Susan Duster is developing a valuable orebody. In the Prince the main shaft is down 250 ft., where the ore is said to be fully as good as anywhere in the mine.

Our branch railroad, which is approaching from Caliente, has been substantially completed to Panaca, the old Mormon town 12 miles below here. A neat freight and passenger station has been erected at that point and an agent installed. Regular passenger service has not been initiated, but the construction trains run on a fairly regular schedule and carry any passengers who desire to ride. The entire grading force is now working within sight of town. Within about two weeks, barring accidents, the grade should be ready for the rails to Pioche station, which will be built about a mile from the centre of the town. Owing to the rapid rise in the ground in that mile the railroad will not approach any nearer for the present. Condor canyon, which begins two miles this side of the Panaca station, was regarded as the difficult part of the enterprise and the one in which the rate of accomplishment could not be closely estimated, but that is now a worry of the past, as the rails are already laid miles this side of it. The steel for the line has been obtained from portions of the main line where the 65-lb. rail to be used on the branch was replaced by heavier steel for the through traffic. This steel has been a little slow in coming in, but the engineer of the branch expects it to come now fast enough so that 2,500 ft. of track can be laid a day until the branch is completed.

The Bristol Consolidated is hauling its high-grade copper ore by wagon to Panaca for shipment instead of waiting for the railroad to reach here. The Mendha and Lyndon mines are also shipping from that point.—A

most important mining transaction was completed last week when the Boston & Pioche Mining Co. bought the famous Yuba East and auxiliary claims and added these properties to their already extensive holdings. The Yuba East is on the great porphyry dike east of the Old Yuba. In the days of the first period of Pioche's prosperity the American Flag on that dike made a great record. In the second period, when W. S. Godbe and his associates were striving to restore this camp to its former activity, the American Flag, rechristened the Yuba, was their great reliance, and is said to have yielded for them over a million dollars. Several years ago, long after this second period passed into eclipse, John R. Cook located the eastern extension of the Yuba, and taking Wm. Lloyd in as partner, started to prospect in their ground for the rich ore which had yielded



Map of Eastern Nevada.

so abundantly in the old mine. It was not long before they struck bonanza ore and began shipping cars of stuff so rich that wealth seemed imminent, when they were stopped by injunction and the mine remained closed until the recent sale removed the embargo. The case was tried, and although there were other points put in issue the only point upon which the court decided against Cook was that because at the time of his location he was a U. S. Deputy Mineral Surveyor, his location was for that reason utterly void. The case was before the Nevada Supreme Court on appeal and a decision had been expected several weeks. Whatever that decision might be it was the determination of both parties to the litigation to carry the case to the Supreme Court of the United States. The Boston & Pioche purchased the claims of each side and while it means a great deal for the prosperity of Pioche to have this important property revitalized it is a serious loss to mining jurisprudence. No adequate motive now remains to induce any one to incur the great expense which would be involved in getting from the court of final resort a ruling on this question, which involves fundamental rights of citizenship. The Boston & Pioche has succeeded to the status of each side to the controversy, and so far as it is concerned the privileges of a U. S. Deputy Mineral Surveyor become purely an academic question. Some years ago this question was decided by the Supreme Court of Utah adversely to the Mineral Surveyor. The case went to the U. S. Supreme Court, which dodged the question and decided the controversy on another point. Other cases involving the same question are now pending in this State, but it seems doubtful whether it will ever be authoritatively settled.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

MALAPAI is a corrupted form of *mal pais*, from the Spanish *mal*, bad, and *pais*, country. It is used in Arizona and the Southwest to designate the black lava-fields or bad lands.

THERE is only one gold dredge in operation in Queensland; this is at Cania, in the Gladstone district. But there are four dredges at work on tin gravel. One of these has paid its first dividend.

THE drip-drop of cyanide over the head of each zinc-box that is precipitating from the weakest solution, makes the zinc more active, so that a precipitation is obtained in a manner usually unattainable from a solution of, say, 0.02% cyanide.

VOLCANIC ash is a misnomer. Ash is the product of combustion; the volcanic 'ash' is the result of violent explosion or fragmentary ejection from the vent of a volcano; it is broken rock that has undergone grinding by abrasion, due to the collision of particles in mid-air. It is dust.

WHEN a valve in a pipe is closed while the water is flowing, the velocity of the water is retarded as the valve descends, and thus a dynamic pressure is produced. If the valve is closed quickly, this dynamic pressure may be much greater than the static pressure, and the result is a 'water-hammer,' or 'water-ram.'

FILTRATION in cyanidation is apt to be hindered by the separation of silica in a colloid form by the action of sulphuric acid (from decomposing pyrite) upon the silicates of alumina and magnesia in weathered ore and old dump. This colloid silica is also likely to explain the film that settles on the zinc in the precipitation boxes, even from a clear solution.

WHEN water is pumped through a pipe from a lower to a higher level, the power of the pump must be sufficient not only to raise the required amount in a given time, but also to overcome the various resistances to flow. The head due to the resistances is thus a direct source of loss, and it is desirable to arrange the pipe so as to render this as small as possible.

ALLOTRIOMORPHIC is an adjective used to describe those minerals in an igneous rock which do not possess their own crystal faces or boundaries, but which have their outlines impressed on them by their neighbors. They result when a number of minerals crystallize at once, so as to interfere with each other, and are especially characteristic of granitoid textures.

THE hydraulic ram is an apparatus that employs the dynamic pressure produced by stopping a column of moving water to raise a part of the water to a higher level than that of its source. It has been widely used for pumping small quantities of water, but is not so well adapted to lifting a large quantity. The efficiency of the hydraulic ram is the ratio of the useful work done to the energy expended in the waste water.

WHERE ores of a number of metals are attacked by surface waters, the result of their difference in solubility is the formation of rough mineral belts. These follow the surface in general, and each is characterized by a preponderance of certain minerals. The effect of descending

waters in deposits containing lead, zinc, copper, and iron, is to form galena above and zinc blende below, with often a third and lower zone characterized by copper, and more rarely, a fourth with iron predominating. These zones, of course, are only defined in a broad way, different minerals occurring together.

A OWNS a placer mining claim; also a ditch which at one time carried water for use on the claim. The mining claim is not now being worked, but A disposes of the water flowing through the ditch to others who apply it to beneficial uses. Has A the right to dispose of the water, or does his failure to utilize it on his mining claim deprive him of all right to the water, rendering it subject to appropriation by others?

The answer is: One acquiring a right to divert and use water from the running streams for a specific purpose may change the point of diversion, place, and manner of use, if intervening rights are not prejudiced. So long as A, or those acquiring rights through him, apply the water to any useful or beneficial purpose, there is no abandonment, and he, or his lessees cannot be deprived of their right by subsequent hostile appropriations. These rights are measured by the extent of actual use and can only be lost by abandonment or non-user for a period of five years. Many of the oldest and largest ditches in the mining regions of California were originally constructed to conduct water for hydraulic mining. Since this industry has ceased, the water is sold by the ditch owners for power, irrigation, and other useful purposes and is delivered at places remote from where the water was originally used. Their right so to dispose of the water cannot be seriously questioned.

An incorporated mining company owns several claims which are not on patented ground; but the title is that of the original locators; the required amount of work being done upon them at stated periods, in the usual way.

The stock of the company is held by two parties, whom it will be convenient to refer to as the Minority and the Majority parties. The Majority, which naturally controls the concern, is careless and indifferent, and among many sins of omission, fails to take proper action to protect the property or provide for the performance of the assessment work; and the Minority, in order to keep the title alive, advances the money required to do the necessary work and takes chances on being reimbursed later.

Several questions arise. One is, what remedy or recourse has the Minority in a case of this kind?

Another is, does the Minority, by so performing the work, the Majority interest having failed or neglected properly to provide for same, although requested to do so, thereby acquire title to the property, *de novo* as an outsider would do? Or would the work so performed be considered as done for and on account of the corporation? The answer is:

Where one of two or more co-owners of a mining claim defrays the expense of performing the annual labor required by law to be performed, he may either compel contribution from the nonparticipating co-owners, or acquire their interest by forfeiture proceedings known as 'advertising out.' Where the property is owned by a corporation, however, the only redress of the contributing minority is by an action against the corporation upon an implied contract to reimburse them for money necessarily expended in protecting the title to the property. Stockholders of a corporation are not co-owners of the corporate property and the forfeiture proceeding of 'advertising out' is not available to the minority furnishing funds to perform the assessment work.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

Conveying Tailing in Launderers.

The Editor :

Sir — The courteous query for more light in your issue of September 14, and signed by Mr. G. A. Overstrom, deserves full data in answer.

The conditions are not quite as Mr. Overstrom takes them. The ore crushed is an exceeding hard tough quartz, with very small admixture of calcite, and no other gangue; it is therefore very sharp and granular. The coarser portion of the pulp which results from battery crushing through 26 mesh 28 wire steel screens is tube-milled, and the resulting screen-test after tube-milling is, as follows:

PULP WHEN USING TUBE-MILLS.		
	Mesh.	%
Remainling on	40.....	3.1
"	50.....	4.4
"	60.....	2.8
"	80.....	4.1
"	100.....	4.3
"	120.....	10.0
"	150.....	3.1
Passed	150.....	68.2

The line has for several weeks at a time, however, been run without the tube-mills running, therefore taking the straight battery product, screen test of which is as follows:

STRAIGHT BATTERY PULP.		
	Mesh.	%
Remainling on	40.....	5.1
"	50.....	5.2
"	60.....	5.2
"	80.....	5.7
"	100.....	5.6
"	120.....	11.8
"	150.....	1.7
Passing	150.....	59.7

The normal proportion of water that these pulps contain in the pipe-line is about five to one by weight, and while there is no doubt that the hydrostatic head formed behind riffles of sand in the pipe when such occur greatly assists in preventing the complete clogging of the pipe, this action has only occurred a few times in the eighteen months that the pipe has been running, and normally has no influence whatsoever. Under normal conditions, embracing all but a few hours since the line was installed, there are no riffles whatsoever in the line and the upper three-quarters of the pipe is entirely clear, the pulp flowing in a smooth rapid stream without ripples or disturbance in the lower quarter of the pipe, precisely as in an open launder. I may say that since adding the second 80 stamps, the line which now carries pulp from 160 stamps is running slightly less than half full.

Mr. Overstrom's difficulty in reconciling the performance with many detailed experiments is shared by many. During the time of installation of the line the number of expert opinions passed upon whether it would run or not and based upon experiences with launders, was very large and with one solitary exception, flatly unfavorable. We had, however, demonstrated experimentally that pulp much thicker than that now being handled and somewhat coarser, would run freely in an identical pipe-line 300 ft. long on a 2½ % grade—running so freely, in fact, that we felt justified in going to a 2¼ % grade to better fit the contour of the country.

The limitations of the line seem clearly marked. With the tube-mills running, no tendency to clog has ever been discovered. With the tube-mills out and on straight battery pulp if the water is reduced to less than five to

one, riffles of sand commence to form at a point about 500 ft. from the upper end of the line, giving notice there by a whistling noise, due to the air disturbance in the pipe, which issues through a blow-hole placed at that point. The restoration of the proper dilution at the thickening cones at once corrects the fault.

The economic importance of being able to transfer tailing over great distance at such small grades and at practically no cost (as evidenced in our expense of P3.57 as the total charges against the carrying of 100,000 tons of ore a mile in distance) is considerable, hence the intrusion upon your space with the foregoing detail.

The wear upon the line to date is not measurable after eighteen months' service.

C. W. VAN LAW.

Guanajuato, September 28.

[In behalf of our readers we thank Mr. Van Law most cordially for these valuable data.—Editor.]

Methods of Advertising.

The Editor:

Sir—Your recent discussion regarding the selling of advertising space by the American Institute of Mining Engineers, has suggested some thoughts which I think it well to offer, whatever may be their destiny in action. Necessity is the Mother of—several things; and Dr. Raymond's suggestion that advertisements be used as a natural and suitable support for the finances of the Institute is well made, and should be carefully and favorably considered; and herein, it seems to me, there lies a great opportunity. This suggestion is not new; it is as common as the annual banquet of the advertising associations; but the idea that it is possible to make the advertising pages of any reputable publication as valuable and as interesting to the reader as the body of the text, is certainly worth following out. No one can give any attention to the remarkable phenomenon of advertising in the modern press without being struck by the fact that not half of the advertisements are well written, and not half of these are properly displayed. Now here is something which needs the attention of the editor of the publication in question, and also by the man who pays for the advertisement. And usually these are the two people who neglect both the phrasing and the display of the advertisement. The latter, the display of the advertisement, is usually left to the foreman of the composing room, or to an over-worked 'advertising editor;' whereas both the display and the wording of the advertisement should be the subject of careful study on the part of everyone concerned. It is possible to tell something in connection with every advertisement which shall be directly connected with the subject matter of the advertisement, which shall be interesting, and which shall be valuable. This idea is possible of almost infinite development and its proper execution will mark a new departure in the history of advertising. A few cases are known where information has been given in connection with advertisements; thus the short series of illustrations showing the different stages in the making of a collar button, another series showing the successive stages in priming, filling, varnishing, and polishing the surface of a well-known make of wagon, are in point. Of course, one will not look for a complete encyclopedic treatise on every subject which is advertised; but the idea of giving some helpful information in connection with every advertisement will draw attention to the advertisement; it will help the advertiser, and it will help the publisher. Every advertisement ought to have a short clear paragraph written in newspaper English, or the English of the street, direct and concise without

being vulgar or careless, which may tell something new but always something interesting and useful. The salesman for the object covered by the advertisement in question always has these paragraphs on his tongue's end—why not put some of them into the advertisement? Why not let the manufacturer put a line or two of his own experience and judgment into the advertisement to help other men? But further enlargement is not necessary. The idea is here; and however difficult to execute, it has come to stay; neither the American Institute of Mining Engineers in its proceedings, nor any other reputable publication, has anything to lose by the wise and judicious use of advertisements. Indeed, as Dr. Raymond says, they contribute directly to the history of the progress and status of the art and however difficult to execute, the idea will undoubtedly be worked out, and successfully. However crude this presentation, I hope that the suggestion may be given the prominence it deserves.

CHARLES S. PALMER.

Boston, October 2.

The Blow Out.

The Editor:

Sir—Referring to the article by Mr. Garrison in your issue of September 28, the very expressive term 'blow out' is, I think, of Australian origin. I found it in common use among miners and mining men in that country in 1884. There it is always used as a term for an isolated mass or small boss of rock, never for a "relatively small narrow mass of rock forming a ridge, rib, or dike, sometimes continuous over a long distance." Such a deposit would be a 'reef,' synonymous with our vein or dike. The word 'blow' also usually carries with it an idea of poorness or barrenness, though often qualified as "a barren quartz blow."

The now famous Mt. Lyell mine was for many years known as the Iron Blow, the blow consisting of a mass of hematite projecting from the ground, somewhat resembling Fig. 1 of Mr. Garrison's article as to situation and size, and having a length of 100 ft. by about 40 ft. in thickness before uncovering. Blows are often used as landmarks or points of locality, as Morris' Blow in the Silverton district, New South Wales. The words 'blow out' would only be used in a descriptive sense as "a great blow out of white quartz, etc." Fig. 3 and 4 would hardly be referred to as blows. They do not stick up out of the ground enough. Fig 3 would be referred to as a 'half buried reef;' Fig 4 as a 'low bluff' or a 'low bench of rock;' Fig. 1 and 2 are typical blows. The word 'blow' as applied to isolated outcrops of rock without length is descriptive and satisfactory, if not scientific.

G. F. BEARDSLEY.

Fruitvale, Cal., October 3.

BARYTES or heavy spar is barium sulphate, the chemical formula of which is BaSO_4 . The mineral is composed of barium monoxide (baryta, BaO), 65.7%; sulphur trioxide (SO_3), 34.3%. The specific gravity is 4.3 to 4.6; the hardness, 2.5 to 3.5. Barytes is usually a white, opaque to translucent crystalline material, about as hard as calcite, but differing from the latter by its greater weight and the fact that it does not effervesce with acids. A common form of the mineral is that of an aggregate of straight or slightly curved plates. It also occurs in granular, fibrous, and earthy masses, and in stalactitic forms, as well as in single and clustered crystals. In nature the material is rarely pure, the most common impurities being silica, lime, magnesia, and the oxides of iron and aluminum. Commercial grades as mined carry 95 to 98% bariumsulpate and 1 to 3% silica.

Right of Mining Locators to Cut Timber in Public Domain for Mining Purposes.

The following query has been sent to us:

"May a person cut mining timbers on 'vacant' land—that is, on either agricultural or mining land which lies handy to his claim, but which is still 'government' land? Or must he confine himself to his own mining claim?"

On this subject the views of Mr. Samuel Platt, United States District Attorney of Nevada, who, under instructions of the Government, is engaged in investigating timber depredations at Manhattan, Nevada, are quite opportune. We quote from an interview appearing in a local paper:

"The law relative to the use of timber upon a mining claim has been very often misconstrued, and in many instances its provisions grossly abused. Until a title in fee by United States mineral patent has been secured by the locator of a mining claim, or his grantee or grantees in interest, the Government retains right to the timber upon his claim. While a possessory owner of a mining claim, performing every act required by the law to hold and work his claim, is for all practical purposes an owner in fee, yet until he receives his patent, the title to the land is in the Government and the right to the use of timber thereon is subject to governmental regulation and control. If it were not for this construction of the law, every mining community could be deprived of all right to the use of timber for building and domestic purposes by a few unscrupulous timber speculators, locating so-called mining claims with no intention of ever working them as such. On the other hand the mere possessory owner is simply encouraged to use whatever timber upon his claim may be necessary for legitimate development of his property. Good faith is the essential thing, and when this is shown, the courts have even given the locator the right to use timber growing on Government land which may be adjacent to his claim and which has been shown to be mineral in character and manifestly unfit for agricultural or other purposes."

To this we may add the following as a matter of general interest to owners of mining claims:

The right to cut timber on unreserved nominal public lands for mining purposes is also given by statute, but this right must be exercised in good faith and in accordance with the rules and regulations which the Secretary of the Interior may from time to time promulgate. Timber so cut must not, however, be transported for use beyond the borders of the State where it is cut. The aim and policy of the law is to enable actual settlers and bona fide locators of mining claims to obtain the timber necessary in the development of their claims and at the same time so to limit and regulate the right as to prevent the wanton destruction of the timber, or its use for commercial purposes.

Where public lands have been included within the limits of a forest reserve, the right to cut timber for mining purposes is so guarded by the Department that it is available under existing regulations only to bona fide miners or prospectors who are personally and in good faith developing their own claims without the assistance of hired labor and who need the timber for the purpose of placing the mine upon a paying basis. Companies and corporations are denied the right, and they, along with the owners of revenue-producing properties, must purchase their timber. No timber may be cut without a permit therefor. Timber from one mining claim may be used on another claim only when they are contiguous and part of a single group of claims which have been located in good faith and not for the purpose merely of obtaining the timber for use on denuded claims.

Handling Residue.

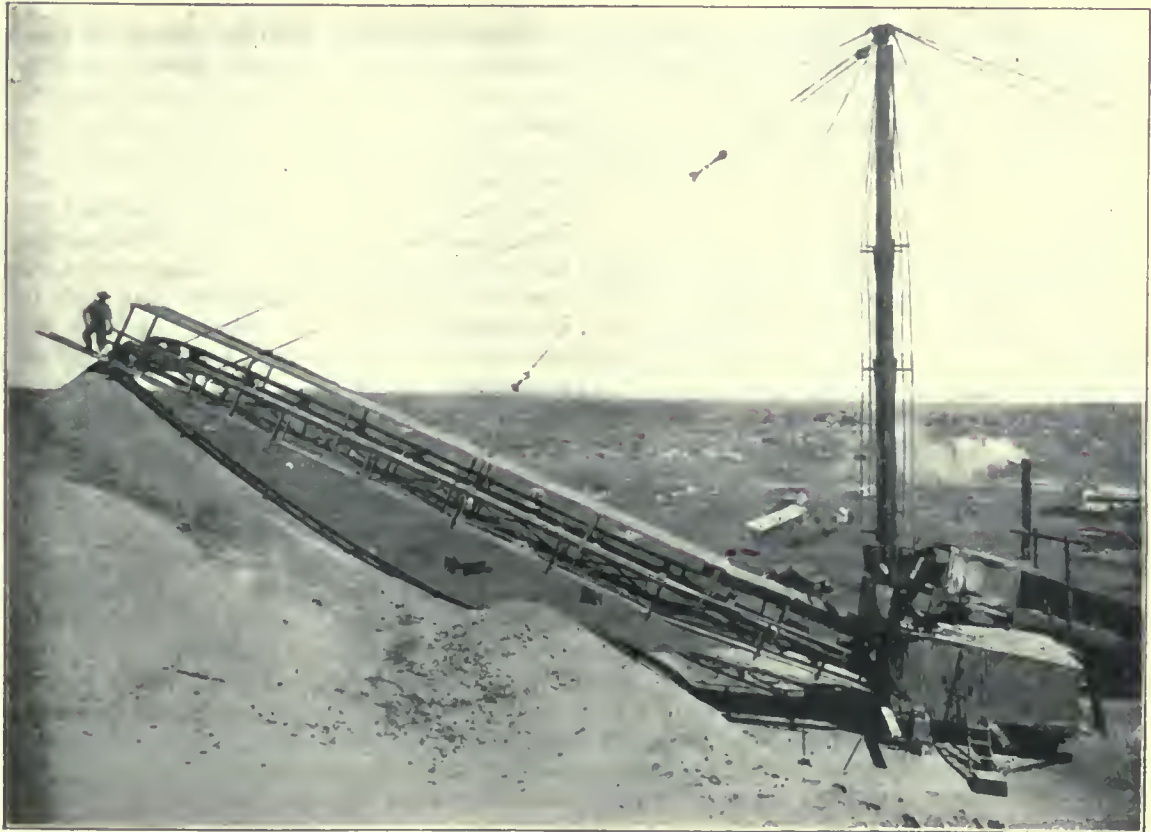
The accompanying photographs, which we owe to Mr. D. E. Bigelow, illustrate the manner of handling the tailing from the South Blocks plant at Broken Hill, New South Wales, and at the Oroya-Brownhill mill, at Kalgoorlie, Western Australia.

The South Blocks mill is peculiar as compared with

launder delivering to the product-bins at the railway siding. There are two of these bins, one being filled and drained while the other is being discharged into the railway trucks. The residue coming away from the Wilfley tables is raised on bucket-elevators and laundered into a nest of settlers, as shown in the photograph. The settlers overflow clear water into the storage-vat, in the foreground, while the down-flow from the



The Tailing-Stacker at the South Blocks Plant, Broken Hill.



Tailing-Conveyor at the Oroya-Brownhill Mine.

other mills at Broken Hill in that there are no trucks used on the surface. Bewick, Moreing & Co. installed the first skips that have been used at Broken Hill for hoisting from the shaft, and these dump direct into a rockbreaker, which in turn delivers onto a belt-conveyor, which empties into the mill-bins. The concentrate from the jigs and Wilfleys discharges into launders, which deliver to an elevator boot, to be raised thence to a high

pointed boxes is run onto a broad draining-belt; this belt is 3 ft. wide and 30 ft. long between centres of terminal pulleys. By means of troughing idlers a basin is formed on the top into which the wet pulp is discharged. The pulp is thickened as much as possible by means of the pointed boxes and a small amount of slime overflows from the tail pulley. The belt runs at a slow speed; the upper pulley, being some-

what higher than the basin, throws the sand with a portion of the entrapped slime onto a standard belt-conveyor, which delivers to the dump. After this dump is built up and settles firmly enough for a foundation, a boom-stacker is to be erected which will carry a belt 60 ft. long at 30° incline and be capable of swinging through a horizontal arc of 180 degrees.

Acetylene Lighting.

By N. GOODYEAR.

*A pound of absolutely pure carbide will yield from 5.5 to 5.8 cu. ft. of acetylene, but chemical purity is not practically possible from an economic standpoint. Between 4.25 and 4.75 cu. ft. is the average efficient yield when used in a good generator. The relative quantities, by weight, of water and carbide necessary to form acetylene and dry slaked lime are 36 parts of water and 64 parts of carbide, which yield 26 parts of acetylene and 74 parts of slaked lime. Water will, therefore, decompose nearly twice its weight of carbide, theoretically, but in practice, in a good generator, about 17 times this quantity is used. The reason for this is that the decomposition of carbide and water into acetylene and lime liberates heat. The quantity liberated from good carbide is 406 lesser calories per gram of carbide, or 730.73 B.T.U. per pound of carbide. One pound of carbide will raise the temperature of 8½ lb. (one gallon) of water about 87° F. Cool generation is essential, as at temperatures in the neighborhood of 700° C acetylene becomes polymerized, forming benzene and other hydrocarbons which condense in the pipes and cause great difficulty.

For the above reasons a good generator should be constructed on the principle of dropping a small quantity of carbide into a relatively large quantity of water. A few years ago, before these principles were understood, nearly all generators were made on the reverse principle, dropping a small quantity of water on a relatively large body of carbide.

Acetylene is conveyed from the generator to the burner through ordinary gas-pipes, but on account of the relatively small quantity of acetylene necessary to give an illumination equivalent to ordinary illuminating gas, much smaller pipes can be used; that is, pipes of half the diameter are ample for the same number of burners. For practical purposes it has about two and one-fourth times the heating capacity of ordinary gas; its calorific value being 1,504 B.T.U. per cubic foot.

In this connection, however, it should be made clear that acetylene for lighting purposes is much cooler than ordinary gas on account of the small quantity consumed to give a stated amount of light, being nearer the electric light in this respect than any other gas. Compared to ordinary 20 candle-power gas it actually emits one-fourth the heat while giving the same light.

According to Prof. Vivian B. Lewes, acetylene is what might be called a 240 candle-power gas; that is, an efficient 1-ft. burner will give 58 candle-power; but, as with electric lamps, efficiency is dependent upon various factors, such as the size and make of the burner.

Some of the most misunderstood facts concerning acetylene are those relating to its safety. It has been shown that acetylene is far less poisonous than the usual illuminating gas sold in cities. It is still to be said that far less gas can pass through an acetylene burner, ½ ft., than would pass through an ordinary coal-gas burner, 5 ft., assuming that both are accidentally left fully turned on and gas escaping at full head. Asphyxiation, in the sense in which we know it as resulting from respiration

of coal gas and stove gas, is entirely unknown to the character of acetylene.

The combustion of all oils or gases used for illumination pollutes the air in an unventilated space. Since the results of burning acetylene are exactly the same in character as when petroleum or coal gas or water gas is used, namely, robbing the air of oxygen and charging it more or less with carbon dioxide; since acetylene, on account of its great brilliance, is used in remarkably small quantities as compared with other gases, one-tenth the volume giving the same amount of light; it would be manifestly unfair to acetylene to dwell on so remote a possibility of danger. It offends only one-fourth as much in this respect as does ordinary illuminating gas.

In case of acetylene or any other combustible gas whatever, two things are necessary for explosion: 1. Admixture with air. 2. Ignition. The gas must escape and ignite. In no other way can explosion result. Suppose a jet of gas is left open; it passes at most a foot of gas in an hour. A room 10 ft. square and 8 ft. high, scarcely more than a closet, is certainly small enough to make a fair illustration. Granted that this room is perfectly gas-tight—a highly improbable condition—in just 24 hours enough gas will be admitted to charge the air of the room to the lowest explosive limit, of 3%. Still this mixture must find a way to become kindled before explosion can possibly ensue. Acetylene in the gaseous form at ordinary temperatures is not explosive in any sense except as referred to above, when mixtures with air become ignited. Acetylene in the gas-pipes or generator cannot be exploded by electric sparks, heat, or concussion.

WORK in connection with the opening of the new coal mines situated in the Campine district, in Belgium, is reported as going ahead in a satisfactory manner. In the commune of Zolder the sinking of the first pit is nearing completion, and the company working this concession proposes sinking a number of other pits. At Coursel four pits will be sunk. The two most important companies holding concessions in the district of Mechelensur-Meuse have amalgamated, and the preliminary work of opening these mines is going ahead rapidly. At Asch the work of exploiting is also being pushed. The most engrossing question in connection with the opening of these new mines, and one that holds out little hope of satisfactory settlement, is the difficulty of securing sufficient labor to operate the concessions. It is estimated that about 10,000 Flemish workmen are at present employed in the Wallon districts, and it is thought that nearly all of these men will return in time to take up work in the mines; but this number is not nearly sufficient to meet the demand that will be created. Each of these concessions to be successfully operated will require probably from 2,000 to 3,000 men, and no one seems to know where they are to come from. Already the agricultural interests are complaining of the scarcity of labor needed to handle the crops, so that unless the present supply of labor can be largely augmented, the companies proposing to operate the new concessions will find themselves seriously handicapped.

AGATE is obtained in considerable quantities in India and is exported both to Europe and to China, as well as worked at some points by native lapidaries. Its source is in the amygdaloidal portions of the Deccan trap flows, and it is collected at numerous places along or near the edge of the trap, especially in the State of Rajpipla, from a conglomerate near a village named Ratanpur. The principal place where it is sold and cut is Cambay, in the Bombay Presidency, though agate cutting is also done at Jabalpur and some other points.

*Abstract of paper read before the Illuminating Engineering Society.

The Diamond Core-Drill in Prospecting.

(Written for California Miners' Association but original burnt in the fire of April, 1906. Now first published.)

By LEWIS T. WRIGHT.

Having had considerable experience in the use of the diamond-drill, I am frequently asked for particulars as to what it can do, or will cost, or for advice as to its applicability. It is exceedingly difficult to answer such questions, even approximately, without a full knowledge of the particular circumstances. I have prepared these notes in order to give engineers who may not have used the diamond-drill some basis for estimating or weighing its advantages or disadvantages for any cases of prospecting they may have in mind. I do not intend to give any instructions as to manipulation of the machine; this must be known to the skilled operator and only a skilled operator should ever be employed for such work.

Diamond-drilling has two prominent advantages. The high speed of operation and the low cost, as compared with driving or sinking by hand or machine-mining, render it a most effective agent. The disadvantage of the small extent of a true orebody that can be sampled by one drill-hole can be compensated for generally by a 'fan' of two or more drill-holes.

The rate at which holes can be drilled depends to some extent upon the hardness of the rock, but by no means upon this alone. The best ground for drilling both as regards speed and loss of carbon (diamond) is often hard, firm ground. Ground that contains soft places, which cave in and clog the drill rods, is most dangerous, not only resisting their rotation but also preventing their extraction, and in such ground a bit with valuable stones may easily be lost. Such ground is not suitable for diamond-drilling without casing. Fissures, or fractured ground from which small pieces of hard rock or quartz may fall into the hole, may interfere with the rotation of the rods and cause the loss of diamonds, on the drawing out of the bit. The best ground for drilling is a moderately hard but even formation, free from broken rotten places, or seams or fault-planes with drag. The casing often indispensable in passing through soft ground or the reaming out of a hole to recover lost rods result in much loss of time. No doubt in hard firm ground the drilling proceeds slowly, but in such cases progress is sure and the rock cores well. In very deep holes the time spent in raising rods for the examination of the bit and lowering is severely felt; but a deep hole generally means good drilling ground. Of course, all other things being equal, the deep hole would go slower on an average than the shallow, but there are many difficulties that cause delay other than the hardness of the ground to be penetrated. In a general way, the influence of depth of hole as affecting the average rate of drilling is felt, but it often happens that the speed of the drilling of one hole to 1,000-ft. depth may average as well as that of another to only 200 ft. in more troublesome ground. In hard ground, such as silicified felsite, I have found in exceptional cases drilling to go as slow as an average of five to seven feet per 10-hr. shift, with holes of moderate depth, say 300 to 500 ft., but in a general way in what is considered by drillers to be hard ground the drilling will proceed for holes to 200-ft. depth at the rate of 20 to 25 ft. per shift; from 200 to 500-ft. depth, at the average rate of 15 ft. per shift; and from 500 to 1,000-ft. depth, at average rate of 12 ft. per shift. It may happen that particular holes average 20 ft. to 500 ft. per shift, and one of the same depth, owing to special difficulties and interferences due to the broken or soft character of the ground passed through, may only average 10 ft. per shift.

As regards ground that is difficult on account of ex-

treme hardness, an average of 5 to 7 ft. per shift is the slowest in my experience. There is a case cited by the Ontario Bureau of Mines, of exceptionally hard granite and some quartz, that drilled at the average rate of 4 ft. 3 in. per shift. The same report mentions limestone that was drilled at the rate of 30 ft. per shift (presumably one shift). Carson gives* the following daily rates of progress:

Rock.	Ft.
Hard gneiss.....	11 to 12
Decomposed gneiss.....	23 to 28
Clay, gravel, and boulders.....	7 to 9
Clay and gravel.....	25

Riley, in hard sandstone and conglomerate, shows an average of 19 ft. per shift. From 33 ft. 7 in. for a hole of 640 ft. to 7 ft. 2 in. for a hole of 373 ft. depth.†

The influence of great depth is shown in the case of a drill-hole in the Transvaal that went to a depth of 5,560 ft., which averaged 13 ft. per day of three shifts, or 4½ ft. per shift, of eight hours. It required seven hours to raise and lower the rods to a depth of 5,000 ft. In the Rand, the ground is considered to be exceptionally good for drilling and short holes drill at the rate of 80 ft. per day.

From the foregoing, a general idea of the speed of diamond-drilling can be formed and compared with driving with compressed air rock-drills, it is seen to be vastly superior. Of course, in the one case a small borehole is left, of no value; in the other, there is a mine working useful for extraction or for development. In ground that, with three shifts working at high pressure, would average 10 ft. per day, for drifts of 1,000 ft. long, it might be easy to put in a drill-hole at the average rate of 40 ft. per day, or four times as fast. Hard ground in which progress could be made by driving at the rate of 5 ft. per day could be easily drilled at the rate of 20 to 30 ft. per day by the diamond-drill. Thus in many cases, special information that a diamond-drill core can afford, could be obtained in one-fourth the time required to obtain it by driving with the best mining methods. The rate of drilling is one of the principal elements of its cost, and that is why I have enlarged upon it.

The loss of carbon by wear and tear in drilling depends chiefly upon the hardness of the ground. It is true that some carbons are softer than others, but for a large amount of drilling, this will maintain an average, for it is hardly likely that all the carbons will be soft. There is about 10% of the weight of carbon purchased that may not be actually exhausted by abrasion, but is lost in splinters or in stones reduced by wear, so as to be no longer serviceable in drilling and having a selling value that is nominal. The black diamond, or carbon, used in drilling, which formerly cost \$10 per carat (1 K = 1 carat = 205 milligrams) now costs \$85 to \$90 per carat. Many of the published costs of diamond-drilling are for work done when carbons cost from \$10 to \$12.

What is the consumption of carbon, both that actually used in abrasion as well as that rendered unserviceable in drilling? This is most important: It depends as before remarked chiefly on the hardness of the ground. The greatest consumption I have noted is 0.08 K per foot drilled. In the case of the hole drilled by the Ontario Bureau of Mines in intensely hard granite, the consumption of carbon was also 0.08 K. In my experience in Shasta county, California, in hard felsite, said by experienced drillers to be harder drilling than in the iron ranges of Michigan, the loss of carbon may amount to 0.04 K, in exceptional cases, and even in rare cases, to 0.08 K, but on an average, for such hard silicified acid eruptives, from 0.01 to 0.025 K might be expected. In the Rand, where the ground is hard, but even and good for drilling, a consumption of 0.02 K per ft. drilled has

*Trans. A. I. M. E. 1890.

† " " 1876.

been noted. In the iron ranges of Michigan in jasper, iron slate, hematite, dioritic schist, from 0.012 to 0.027 K has been recorded.

In addition to the loss by abrasion and reduction of carbon to unserviceable size, an accident may happen by which carbons are lost. The whole bit may be lost. A stone may be pulled out in the lifting of the rods. This is attributed sometimes to a small pebble that has fallen as a broken piece of rock, from the side of the hole when in broken ground, which piece of rock jams between the rod and the side of the hole and rolls around with the rods. The drill-runner if careless may start drilling without water and tear and burn the bit. The rods may clog in the hole from soft sticky ground, which should have been cased, and be torn apart on lifting, leaving the bit, irrecoverable, in the hole. With skilled men these accidents do not often happen, but they have occurred. No doubt most of these accidents could be avoided by extreme care and caution. It happened to me once that the bit unscrewed. Why that happened was never quite clear, but it was connected with a large vug or cave that was encountered in the drilling. It is unsafe to drill in soft ground, and in hard ground, seamy and fractured, great care must be exercised to avoid the stones being torn out of the bit. It is useless to begin diamond drilling without a thoroughly competent and careful bit-setter and drill-runner. Having indicated sufficiently what are the speed of drilling and loss of carbon in different classes of ground, it will be possible to discuss the question of cost.

In regard to labor for operating the drill; the crew will be assumed to consist of a bit-setter, two runners, and two helpers for two shifts, at a cost of, say, \$17 per day of two shifts, though one bit-setter should be able to set the bits for two drills. Thus, for a hole averaging 20 ft. drilled per day of two shifts (not very fast), we have a cost of 85c. per foot for drilling crew. For extremely hard ground, the cost would hardly be twice that, and for softer, but firm rock, one-half. There are, however, other labor expenses, such as cutting cordwood, as well as in grading drill-stations, making trails, handling and packing supplies. The extent of this must depend upon the locality and nature of the work. The cost of cordwood alone amounts to 25c. per foot drilled, where wood-choppers are paid \$2.50 per day. Sundry supplies, lubricants, and so forth, may cost 15c. per foot drilled.

The cost of drilling will therefore depend upon the circumstances of the case. Let us suppose a case of hard but firm ground that offers no other difficulty to its penetration by the diamond-drill than its hardness. In such ground the wear of carbon may be 0.025 K at \$90 per K, and the rate of progress to 1,000 ft., 20 ft. per day. The cost might then be:

Item.	Per foot.
For labor operating the drill.....	\$0.85
Carbon 0.025 @ \$90.....	2.25
Cordwood (or other power).....	0.25
Sundry supplies.....	0.15
	<hr/> \$3.50

In less hard ground that drills at the rate of 50 ft. per day of two shifts and with a consumption of carbon of 0.01 K per ft. the cost might be estimated as follows:

Item.	Per foot.
Labor for operating drill.....	\$0.34
Carbon 0.01 K @ \$90.....	0.90
Cordwood or power.....	0.25
Sundry supplies.....	0.15
	<hr/> \$1.64

These two estimates will fairly represent the two extremes.

This does not include any superintendence other than that of the bit-setter, who is generally the foreman, or

expenses in getting the machinery onto the ground, or wear and tear of machine, drill rods, boiler, or tools, or loss in value of equipment. These other items will be very much affected by the amount of drilling done in the campaign. The diamond-drill requires steam, compressed air, or electric motive power. It would be well if some gasoline motor could be devised, to save the heavy expense of moving a boiler in difficult country, or the consumption of water where this is scarce. Also the discovery of a substance (such as might be made in an electric furnace), that would be a substitute for the now enormously expensive carbon or black diamond. As regards cost, it will be readily seen that an orebody could be reached and a core sample taken at a cost less than one-third the cost of driving, and in one-fourth the time. It is only with the full knowledge of the circumstances governing each that an engineer is able to decide whether to diamond-drill or to drift or sink.

A drilling machine with its equipment, to drill under ordinary circumstances to a depth of 800 ft., will cost f. o. b. Chicago about \$3,000. This does not include diamonds. The engineer can estimate the amount to be charged to the drilling for the amortization of the capital outlay for the drill and its equipment. It would seem that where the amount of drilling to be done is but a few thousand feet that it would be better to contract for it rather than to buy an outfit and organize a drilling crew.

THE Canadian Government recently published the report of a commission appointed to investigate the zinc resources of British Columbia. The conclusions drawn are that although the zinc industry is yet in its infancy in British Columbia, it is capable of great development. While several of the mines now being worked are essentially zinc mines, there are some silver-lead mines in which zinc blende is found in considerable quantities. Until recently the zinc in the silver-lead ores was regarded as an impurity to be gotten rid of by the easiest and cheapest means possible. The increased demand for zinc of late has made valuable as a by-product this zinc blende, which was formerly a troublesome impurity. The commission regards 15,000 tons of zinc ore of 50% grade as a liberal estimate of the present annual production of the Slocan district, and it is calculated that the Ainsworth district can produce 100 tons daily of 50% ore. There are many mines and prospects in other portions of the Province which are supposed to carry zinc in paying quantities. A zinc smelter has been established at Frank, Alberta, the plant being close to a coal mine and on the route from the mines to the market. The large amount of fuel required in reducing zinc ore renders it necessary that coal shall be near the smelter.

MINING IN TURKEY.—In the past six months more than 160 petitions have been presented to the authorities for prospecting licenses in the Vilayet of Trebizond, Turkey, most of the mines in question being situated between Kerassund and the Russian frontier. The whole of this country, to a distance of 10 hours from the shores of the Black Sea, would appear to be extremely rich in minerals. Doubtless much wealth is still awaiting exploitation, and the late rise in the price of copper seems to be tempting capital from certain quarters to enterprises which, owing to obstacles that should not be insurmountable, have missed prosperity of recent years. In the Vilayet of Trebizond are to be found manganese, copper, silver, lead, and zinc, and iron is everywhere abundant and within such easy reach that villagers extract, smelt, and fashion it themselves into implements of everyday necessity. Mineral springs are plentiful, and many of them appear to be of medicinal value.

The Nile as a Mining River.

Written for the MINING AND SCIENTIFIC PRESS
By ALEXANDER DEL MAR.

It may appear surprising that the Nile, which from time immemorial, has been regarded chiefly as a great agricultural stream, should be classed among mining rivers; yet there is ample warrant for so doing. Not only this, but its history as a mining river appears to be more ancient and—considering the geographical changes it has brought about—it is certainly more important than when viewed from an agricultural aspect.

In the remotest historical period, the Nile, though never a rapid stream below the junction of the Blue river, had undoubtedly a greater fall than at present. The occurrence of rock at numerous places in the bed did not as now form merely rapids, but cataracts, as their ancient names attest. The hills of Sennaar and Nubia, which are now destitute of timber and water, were once wooded, and from their flanks flowed numerous feeders, which, after enriching the soil, added their floods to the Nile. These feeders now flow underground, through the mining debris which underlies the plains. Klunzinger's 'March from the desert of the Nile to the Red Sea,' contains many allusions to these streams, for example: "Channels are seen on the sides of mountains, traces of brooks, of waterfalls, of the beds of rivers, some of them strewn with wide valleys of embouchure. Nay, along the very summit of the mountain mass runs a regular water-shed, from which waters must run either westwards into the Nile valley, or eastwards into the Red Sea." "The soil in which we are marching is not loose sand, but very solid gravel."

The Bisharee or gold country was once cultivated and populous. "That the valley was once a busy scene of life is evidenced by the numerous ruins and ancient Egyptian sculptures hewn on the rocks," says Klunzinger. It is now and has been since the time of Cambyses, a vast desert of sand and gravel. The Nile, which now washes the Arabian side of the valley, formerly skirted the Lybian side. There are still some traces of an ancient river-bed along the western hills. From Lat. 27° N. to the sea, a portion of Egypt was at one time a morass. It seems to have been like the Po and the marshes of Lombardy during the Middle Ages. This was probably during the first era of mining and before the river was diked by Menes; it is now all dry land and treeless. The Nile once emptied into the sea, a little below where Cairo now stands. At the present time it runs 90 miles farther, through a delta whose vast dimensions owe their foundation to the operations of those multitudes who for countless generations were employed in washing the sands of the Bisharee region for gold. The certainty that at least a portion of the vast quantities of gravel and sand which can be seen to have been washed down from the Bisharee region, lies beneath the loam which now covers the Delta, defeats all devices for maintaining the level of the water in the canals and reservoirs by pumping, bailing, and ludding. This work and the digging of fresh canals engross the labor of the people for months. Without this incessant struggle with nature the land would become uncultivable and even with it, the result is often doubtful; for if the next overflow of the river exceeds 30 ft. in height everything on the land is demolished and swept away; while if it fall short of 18 ft. the harvests fail and famine ensues. The abject and defenseless character of the people that had to depend upon it for support, explains the frequency of their subjection to foreign conquerors and the great number of alien dynasties to which Egypt has been compelled to submit. Dur-

ing the course of 26 centuries these have been no fewer than 16 in number, with an average duration to each dynasty of not more than 165 years, as follows: B. C. 525, Persians under Cambyses; B. C. 411, independent Egyptian kings; B. C. 351, Persians; B. C. 332, Greeks, under Alexander; B. C. 30, Romans, under Augustus; A. D. 616, Persians; 626, Romans; 639, Arabs; 1171, Turks; 1250, Mamelukes; 1517, Turks; 1798, French, under Napoleon I; 1801, British protectorate; 1802, Turkish protectorate; 1804, independent Pashas, like Mahomet Ali; 1881, British protectorate. This furnishes a curious contrast with China, which during 40 centuries has not changed its dynasties half a dozen times.

The civilization of Egypt, like that of most ancient countries, appears to have begun in the hilly regions. Before the Delta assumed its present vast proportions the only considerable agricultural surfaces in Egypt were in the Fork (anciently called the Island of Meroe), in the plains below the Fork, and in the foothills of Nubia. The edifices and works of art discovered in Meroe and elsewhere in Nubia and Upper Egypt appear to have preceded those which have been found in the lower country. The Egyptians and Nubians are regarded as of Indian origin. Their physical appearance, their complexion (that they were not black like the Ethiopians is noticed by Pliny and Rawlinson), their pyramids and earliest edifices, their ecclesiastical and political institutions, and the origin of some of the plants and many of the articles of commerce found in their tombs, all point to this conclusion.

The term Nubia appears to have originated in Egypt, where Nob or Nub signified gold, hence Nubia, the land of gold. Nubia has been regarded as the Ethiopia of the ancients; it embraces the foothills of the mountainous ranges that constitute a great part of Abyssinia. Egypt is a country where the characteristics of all great gold mining countries are apparent, thus, the Sierras, Abyssinia; the foothills, Nubia; the plains, Egypt; the connecting link between them all, the Nile. Analogous geographical surroundings characterize the Po, the Rhone, the Rhine, and the Sacramento. Like Italy and Abyssinia, Nubia has also its coast range. This separates the Bisharee country from the Red Sea and rises to an altitude of 6,000 ft. Below the foothills of Nubia is a vast expanse of sand and gravel, known as the Bisharee or great Nubian desert. This, as we shall presently see, was once the centre of the greatest gold mining works known to the ancient world. According to Diodorus, the Pharaohs derived from this region in gold and silver, a sum which Jacob computes to have been equal to \$30,000,000 per annum. If this computation can be depended upon, the Nubian mines were as prolific as have since been those of either Italy, Spain, Brazil, Russia, Australia, or California.

In lower Nubia, in or about the same latitude as the second cataract of the Nile, lie "vast and fertile, but neglected, plains, which, it is conjectured, were, at some remote period reached by the inundations of the Nile," says the encyclopedist. If the inundations of the main stream could have reached these plains at any former period, they certainly can reach them now, when the bed of the river is higher than it ever was before. At Thebes it has been raised seven feet in 1,700 years and at the Delta more than half as much. So that the encyclopedist must be mistaken as to the cause of the desolation noticed. The fact is that anciently Nubia was watered by numerous small streams that flowed into the Nile and were employed to irrigate these deserted plains—once the Lombardy of Africa—but which, after they had been diverted by the gold miners, and their sources of supply destroyed by the felling of mining timbers in the foot-

hills, fell into the condition of 'washes,' which now are only flooded for a brief period during the rainy season, March to May, and are dry for the remainder of the year. These dried-up water-courses are called by the Arabs, 'wadies.'

Such is Nubia today. Its hills have been leveled into a plain of sand and gravel; its alluvial soil has been washed into the Nile, which has transported it a distance of several hundred miles to fill up the morasses and form the Delta of Egypt; its rivers have been either dried up or submerged; and where man has not abandoned it, he has degenerated to the level of a savage.

Treachery, dishonesty, and drunkenness characterize the men, and vulgarity and licentiousness the women. The Bishareen are dishonorable, faithless, and vicious, say Klunzinger, Malte Brun, and McCulloch. Many of them are worked as beasts of burden to tow the boats on the Nile. Both sexes go naked, and the money of the country is a sort of broom-corn, called *dourra*.

Gold has been found in nearly every region tributary to the Nile, from the equator to the first cataract. The following is a summary of those regions too distant or too unimportant to be connected with the supply of water or the integrity of the great river channel of Egypt:

Curzon says that in the 'fifties he met at Assouan a European from the mountains beyond Darfoor; this man showed him several iron-bound chests full of gold from that region. Some of the gold was in nuggets, but most of it was in the form of rings the size of bracelets, and others of the size of large heavy finger rings, all of pure gold. These rings were passed in Darfoor as money and were of the exact form of those used for the same purpose by the ancient Egyptians and of the rings or bangles found in ancient Celtic and British countries.

Kordofan lies between Darfoor and the Nile. It abounds with auriferous placers, which were washed by slaves. The trade in gold was formerly monopolized by the Pasha; when gold was sold clandestinely at the rate of \$8 in silver for 430 grains of fine gold, equal at the old rate to \$17.30 per oz. Troy, or about 15% under the mint value.

The Takale district, on the west bank of the White Nile, in the Kordofan country, Lat. 12° N., is spoken of by Pinkerton as a placer country. At Luca, apparently in the same district, as well as at Sheiban, gold, probably gold dust in quills, is the only money.

Albuquerque, a Portuguese commander, gold-hunter, and pirate, landed on the Coast of Abyssinia about the year 1510, and at once proceeded to ransack the country for gold. Among the means that he employed, was to enslave the living, and plunder the graves of the dead. His rapacity and cruelty left so strong an impression on the natives down to a very recent date, that the use or possession of gold was strictly forbidden in the kingdom of Shoa. The monopoly of the gold trade by the sovereign of that country may have something to do with this interdict. The Suakin merchants deal in gold brought from the Fazooglu country, on the Blue Nile, which is in latitude 11° N. In October, 1838, Mahomet Ali left Cairo in a steamboat to visit this region. The mines proved to be near the confluence of the Blue Nile and the Fazangoro. After inspecting them, he left a colony to work them for wages, and laid the foundation of a town near-by, to contain 1,500 families; but the mines failed to pay, and the workings have gone to ruin. The previous productiveness was due to the fact that they were worked by slaves, who were paid nothing for their labor but blows and a scant living.

In the Kaffa country south of Abyssinia and in Lat. 7° N. gold used to be found so plentiful that it was not

much dearer than silver. But all this has changed since the railroad reached Khartoum.

Adowa is in Abyssinia about 50 miles from the Takaze and in Lat. 14° N. Gold is one of the principal articles of the transit trade through this place and of the export trade from Abyssinia generally. Some of this gold probably comes from the Kappa country. Cosmas, a Greek trader, who visited Ethiopia (Abyssinia) about A. D. 535, gave an account of this trade, which in his time appears to have centred at Axum, the capital. The gold came from a country called Sasu.

Strabe, while describing Meroe, says: "There are also mines of copper, iron, gold, and various kinds of precious stones." This reference is applicable not merely to Meroe, which is an alluvial plain containing no gold mines, but to the whole of Nubia. The mention of gold mines in connection with Meroe may have been derived from the fact that Shendy was a mart for the gold of the Upper Nile regions. It is so still.

There are no gold mines below the cataracts. The first or lowest cataract is in Lat. 24° N., and this, therefore, is the northern limit to the gold mines of Egypt.

The above list comprises all except the Bisharee gold mines in the valley of the Nile from the 11th parallel, which may fairly be regarded as the extreme southern limit of Egyptian authority, to the 24th parallel, north of which no mines have been found. Besides the gold mines of the Nile valley, there are numerous others in the surrounding countries, other than those mentioned by Herodotus, in Thalia, which are supposed by Rawlinson to have been in the Somali country. This is on the south coast of the gulf of Aden. At the present time there are some small lots of dust shipped from Leila and Berbera. There are gold mines, also, in the Kaffa country previously noticed, and others in the Coast range of the Red Sea.

We now come to the principal gold region of Egypt, and the greatest of all antiquity. The principal gold mining district of antiquity was in the Bisharee country, situated in the great Nubian bend of the Nile, between Lat. 20° and 22° 40' N. and Long. 32° 30' and 35° 20' E. In the Pharaonic period, the produce of these mines was sent down the Nile; the shipping port being Edfou, or Epollinopolis Magna, or Redesiah, in Lat. 24° 53'. It was ten days journey northwest from the mines. Opposite to Edfou was Bahayreh. In the Ptolemaic period the shipments were to various ports on the Red Sea, among them Berenice, Lat. 24° N., a distance of about 260 miles from the most productive mines. This place is now a mere ruin. The southern extremity of the Bisharee country is below the 3rd cataract; while its northern extremity extends to half way between the 2nd and 1st cataracts.

The Bisharee country forms the foot-hills to the sierras of Abyssinia, which are 12,000 to 15,000 ft. above sea-level, the highest of the hills being about 6,000 ft. in altitude. They gradually diminish until they meet into the plains of Egypt.

According to Linant de Bellefonds, there were gold mines at about twenty places in the Bisharee region, the uncouth names of which we omit.

Next to the mines of the Altai mountains in Asia the Bisharee mines of Egypt are probably the oldest in the world; and in view of the supposed East Indian origin of the Egyptians, and the distant researches and conquests which have been made by the leading nations for the acquisition of gold, it seems not at all improbable that there existed a close connection between the discovery of the Egyptian mines and the settlement of the country by Asiatic races. At what era this occurred cannot be determined with any approach to certainty. If conjecture be

admitted where dates are uncertain, it appears likely that the Bisharee mines were worked as early as the era of Menes, which is variously assigned to from 16 to 19 centuries B. C., for in the time of that monarch the Nile was dike, and from the character of this river and its surroundings there could have been no necessity to dike it until mining had surcharged its waters with sediment.

That Menes was an Indian conqueror and lawgiver; that the Indian code of Menu, still extant, and assigned variously to from the 16th to the 21st century, B. C., is evidently re-compiled from an older code, now lost; and that commerce between India and Egypt existed from the remotest times mentioned in history or derived from archaeological remains, are some of the facts that support these dates.

However this may be, the Bisharee mines are known to have been worked for quartz so long ago as the 15th century B. C. From the fact, understood by every miner, that quartz is never worked as long as the placers are profitable, and judging from the experience of Italy, Spain, and Brazil, where equally extensive placer deposits were worked, as in Egypt, by the hand-labor of slaves, the Bisharee placer mines were at least 200 years old when the quartz was worked during the 15th century B. C. This carries the era of their discovery back to the 17th century B. C.; and they may be even older.

The next date at which these mines are known to have

of people. For the Kings of Egypt condemn to these mines not only notorious criminals, captives taken in war, persons accused of false dealings and those with whom the King is offended, but also all the kindred and relatives of the latter. These are sent to this work either as a punishment, or else that the profit and gain of the King may be increased by their labors. There are, thus, infinite numbers thrown into these mines, all bound in fetters, kept at work night and day, and so strictly guarded that there is no possibility of their effecting an escape. They are guarded by mercenary soldiers of various barbarous nations, whose language is foreign to them and to each other, so that there are no means either of forming conspiracies, or of corrupting those who are set to watch them. They are kept to incessant work by the rod of the overseer, who besides, lashes them severely. Not the least care is taken of the bodies of these poor creatures; they have not a rag to cover their nakedness; and whoever sees them must compassionate their melancholy and deplorable condition; for though they be sick, maimed, or lame, no rest or any intermission of labor is allowed them. Neither the weakness of old age, nor the infirmities of females excuse any from the work, to which all are driven by blows and cudgels; until, borne down by the intolerable weight of their misery, many fall dead in the midst of their insufferable labors. Deprived of all hope, these miserable creatures expect each



In the Nubian Desert.



On the Road to the Nile Valley.

been worked is under Thutmose III of the 18th dynasty; Seti Sethos, or Sethosis of the 19th dynasty, and Ramses or Rameses II; son of Sete. All these dates are derived from inscriptions on the neighboring rocks and temples and possess the highest archaeological value.

The vast sum of silver and gold that is said to have been contained in the treasury of Rhamsinitus, a monarch whose era is attributed by Rawlinson to the 18th dynasty, points to the working of the Bisharee mines for gold and commerce with India for silver. The quantity of gold among the spoil carried away from Egypt by Cambyses, about B. C. 526, part of which was regained by Ptolemy Eucgetes B. C. 346; the extent of the tribute imposed by Darius, which was 700 talents besides 7,000 talents worth of corn and the produce of Moeris and the annual revenues of Ptolemy Auletes, the father of Cleopatra, which were 12,500 talents per year, imply—if these treasures are meant to be expressed in gold—the production of this metal upon a large scale.

In B. C. 50 the Bisharee mines were visited by Diodorus Siculus. He says: "On the confines of Egypt and the neighboring countries there are regions full of gold mines, whence, with the costs and pains of many laborers, much gold is dug. The top soil is naturally black, but in the body of the earth there are many veins of shining white quartz, glittering with all sorts of bright metals, out of which, those appointed to be overseers cause the gold to be dug by the labor of a vast multitude

day to be worse than the last; and long for death to end their griefs."

During recent times the Bisharee mines were visited by Mahomet Ali, Belzoni, and Linant de Bellefonds; the first of these reopened and worked some of them for a short time, but without success.

TUCKED away in an editorial article on the transmutation of metals in the *Independent*, is a statement which, if true, should influence powerfully the imagination that has lately played over the phenomena of radium. "That we may be able some time to reverse the process [the breaking down of atoms]" says the writer, "and change lithium into copper and copper into gold, is conceivable, but if possible it would not be profitable, because the amount of energy necessary to be absorbed to effect the transmutation would cost more than the gold produced." The alchemy toward which science was just groping, thus turns out to be an industry that could never hope to pay dividends. Instead of the unimaginable enrichment of the inventor, or the utter demoralization of values predicted by various romancers, the actual making of gold from a base metal will be a mere laboratory curiosity, considerably less entertaining than Prince Rupert's drops. We can even foresee the philosopher's stone being peddled about Wall Street in the hopeless search for a banker willing to underwrite so useless an invention.—*Evening Post.*

Lining for Tube-Mill.

The use of silex for lining tube-mills has been discarded at the El Oro mill, in Mexico, and in place of it bar plates, made of cast iron, are employed. See accompanying drawing and photograph. This device has

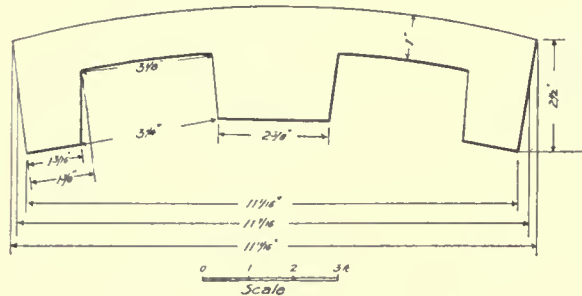


Fig. 1. Bar Plates for Lining Tube-Mill.

proved most successful. During the revolution of the mill the pebbles are hammered by each other into the recesses between the bars or ribs, and thus a kind of silex lining is formed. The pebbles lodge there very firmly indeed and wear down almost to the one-inch web. This

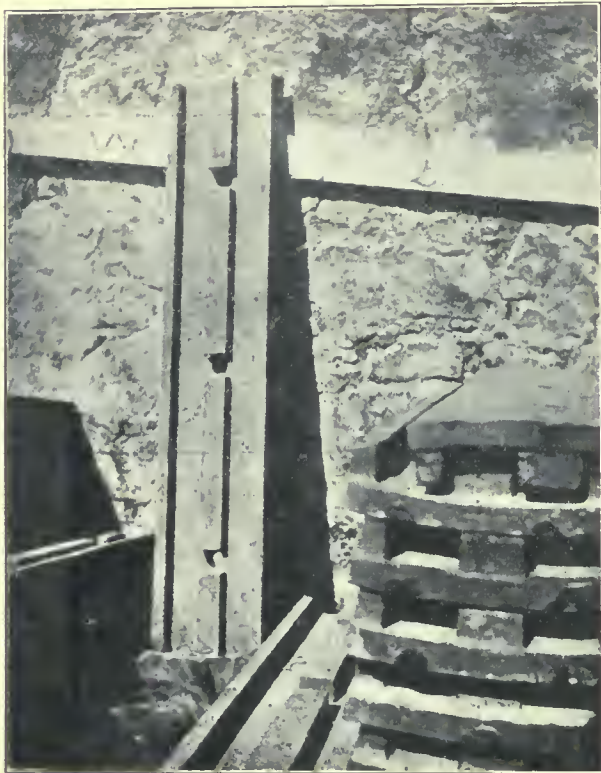


Fig. 2. Bar Plates.

is also allowed to remain until it is completely worn out, just as in the case of the ordinary flat cast-iron liner, and, naturally, at very much less cost. The plates are made of such lengths as to best suit the bolt-hole spacings of the mill. The use of the more flinty portions of the ore as grinders was not a success.

GYPSUM IN CANADA.—Gypsum occurs in New Brunswick, near Hillsboro, Albert county, and in Ontario, where it is exploited principally along the valley of Grand river from Paris in Grant county to near Cayuga in Haldimand county. Extensive, but undeveloped gypsum beds occur also along Moose and French rivers, near James bay; and in Nova Scotia thick beds of gypsum occur near St. John harbor, Port Bevis, and Baddeck bay. A large deposit of gypsum occurs on Manitoba lake.

The Camp Bird Mine.

This splendid gold mine, near Ouray, Colorado, has proved one of the best speculative enterprises in which English money has been placed. The property was bought from Thomas F. Walsh in 1902, the price being \$5,300,000, mostly cash. The annual report just issued shows that for the twelve months ending April 30, the mill crushed 38,295 tons of dry ore, giving a gross value of \$1,273,175. The gross earnings during the period were \$1,341,513, and operating expenses \$416,201, leaving net earnings for the year of \$925,312.

The detailed statement gives the results of operations, which shows an increased cost of nine cents per ton, due to a lower ratio of concentration; on the other hand, mining costs show a decrease due to less ore having been broken down. The operating results, however, have been satisfactory in view of the difficulty that has been encountered in securing labor.

The total amount of development work undertaken was 2,997 ft. In the report William J. Cox, the general manager, states the result of every foot of exploration in the various parts of the mine, the nature of the development being indicated by statements as to 'pay-ore,' 'no ore,' and 'country rock.' In this way the stockholders can see at a glance how the mine is being opened up.

"During the past year," says the report, "there was expended \$26,562 in construction work. The operations during the year have confirmed the estimates given in the last annual report. A careful and conservative estimate of the present ore reserves shows: Broken ore reserves of 112,000 wet tons which will yield a net profit of \$1,850,981; unbroken ore reserves of 89,000 wet tons which will show a net profit of \$1,736,906.

"The total net profit to be derived from the ore reserves is estimated at \$3,500,000, a decrease of \$800,000 as compared with the net value of the ore reserves shown in the last annual report. The reserves have decreased in a large part due to the fact that the company has been unable to carry out development work as vigorously as it had wished to on account of the shortage of labor, and also that our development work has only been carried on during about half of the year.

"The new plant, which started operations on November 1, 1906, was rapidly built, and is now running satisfactorily. It was built for less than the estimated cost, and also within the estimated time mentioned in the last annual report."

The results of the operations during the last five years are shown in the table below:

Year ended April 30	Gross earnings.	Profit at the mine.
1903.....	\$1,976,289.68	\$1,233,007.42
1904.....	1,923,911.74	1,217,783.56
1905.....	2,342,361.45	1,656,301.54
1906.....	1,910,567.93	1,231,864.68
1907.....	1,341,513.99	925,312.55
Total for five years.....	\$9,494,634.79	\$6,324,269.75

From the ore treated during the year an extraction of 95% of the gold contents has been obtained, yielding \$34.99 per ton. The manager reports that, exclusive of depreciation of plant, the cost was \$7.69 per ton, of which amount 67 cents is for taxes. There was, in addition, \$1.56 per ton expended in development.

The report shows that the ore reserves have decreased to 201,000 tons, as compared to 210,920 tons in 1906 and 231,497 tons in 1905; concurrently the estimated profit on these reserves has decreased from £993,853 in 1905, to £881,117 in 1906, to £717,213 in 1907. Developments in depth have proved disappointing.

Attachment Between Rope and Sinking Bucket.

Written for the MINING AND SCIENTIFIC PRESS
By CHAS. B. BRODIGAN.

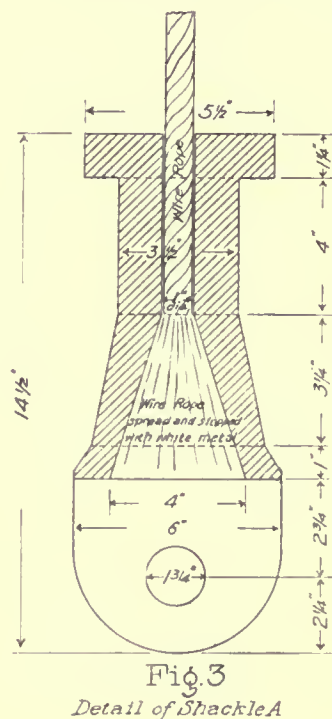
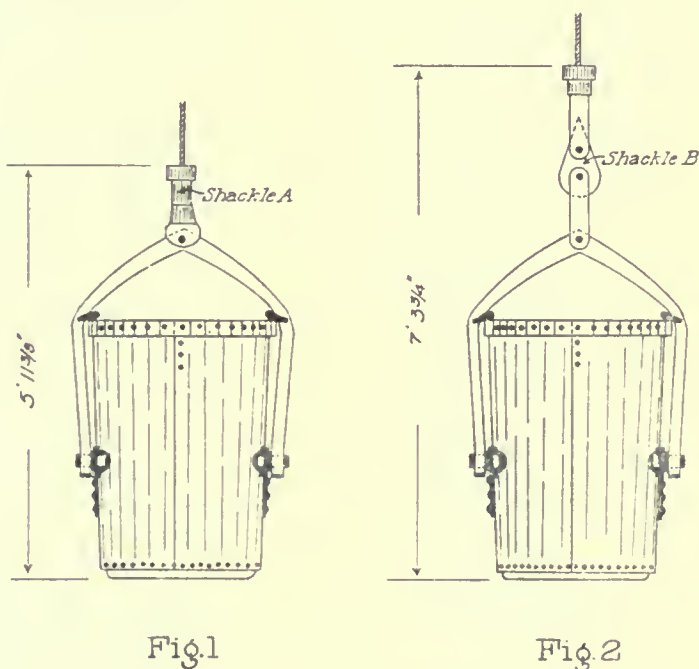
During the sinking of the deep-level shafts on the Brakpan Mines, Ltd., in the Transvaal, a lot of trouble was caused by the sinking-bucket developing a tendency during the hoist to swing violently and foul the shaft-timbers. This trouble has been experienced in practically every deep-level shaft sunk by the aid of buckets, as distinct from skips, and it generally occurs at a depth of 1,700 to 2,500 ft. The reason for the swing is hard to determine and perhaps, when found, possesses but an academic interest. The writer decided that looking for reasons was a vain pursuit, and that the swinging was a necessary evil; the only thing to do was to shorten the connection between the rope and the bucket and so prevent the swing attaining a dangerous amplitude.

To accomplish this shortening, the 'capping' shown in Fig. 1 and 3 was designed and made. It has now been in use for four months without the slightest trouble being

claim made for it is, that applied to hoisting ropes, it satisfied all that was required of it.

In order to illustrate the shortening that was effected by using the new capping, a sketch of the ordinary thimble splice attachment, formerly in use, is given in Fig. 2. The new form of attachment can be fixed up in a shorter time than would be taken in making a splice, the actual time taken being 45 minutes.

THE production of roofing slate in the United States in 1905 amounted to 1,241,220 squares (a square covering 100 sq. ft.), valued at \$1,575,000. In 1906 the value of the product was \$5,668,000. Generally speaking, the difference between a shale and a slate is that the former is straticulated parallel to the planes of deposition and the structure is due more or less to the pressure of the overlying material, while slate has more even layers, with a smoother cleavage, and has derived its slaty structure from lateral pressure, the plane being independent of the bedding and at right angles to the direction of the pressure. This makes slate an intermediate



Attachment for Rope of Sinking-Bucket.

experienced from the swinging bucket. The construction of the attachment is clear from the diagrams, and it will therefore only be necessary to describe how the rope is fixed to the cap.

The rope is threaded through the central hole, and then the end is spread and each individual wire cleaned thoroughly. This is best effected by boiling the end of the rope in a solution of caustic soda, and then wiping the wires with a cloth. The clean wires are then dipped in a solution of zinc chloride and into a bath of molten tin. In this manner a coating of metallic tin is given to the wires, which enables the subsequent stopping of Magnolia metal to adhere firmly to them. As soon as the wires are properly tinned, the rope is pulled back until the tinned wires fill the cone of the cap; Magnolia metal is then poured in, and the attachment is complete.

As regards strength, the writer has had a capping tested in the Government Testing Laboratory, and it was found that the rope broke outside the capping, showing that the attachment is stronger than the rope. The idea of this new capping was suggested by seeing the engineer of the testing laboratory using practically the same white metal cone for testing ropes to destruction, and the only

stage between a clay rock, like shale, and mica schist, and slates may be of any age where metamorphism has altered clay rocks to the slate stage. They are generally absent from the Archean, because if clay rocks did exist in that age they have been changed to mica schists; also, they rarely exist in post-Paleozoic rocks, as these have usually not been exposed to extensive metamorphism. The commercial value of slate depends upon the presence of the perfect cleavage. If jointing is too strongly marked in the deposits, too much goes on the dump as waste, as was found to be the case in the Huronian slates in Baraga county, Michigan. Good roofing slate is quite rare, as either it cannot be mined economically, or because the texture is not uniform, the color not suitable, cleavage not sufficiently, or too highly, developed, or joint planes too numerous. A good roofing slate must have only one well developed cleavage, must be massive and strong, of permanent color, and not too brittle to be cut into regular forms. The principal use is for roofing, but it also is valued for slates, strips, flagging, mantels, sills, washbowls, and many other purposes. Pennsylvania has always produced more than any other State, with Vermont second, and Maine third.

The Great Comstock Lode.

Written for the MINING AND SCIENTIFIC PRESS
By G. MCM. ROSS.

The discovery of the Comstock was a natural consequence of the prior discovery of gold in California. From the eastern slope of Mt. Davidson in the year 1850, it was possible to see the trains of emigrants moving westward. Those who had learned the limit of physical endurance of man and beast rested after their weary march across the desert before undertaking the crossing of the Sierra Nevada, the last barrier between them and the land of gold. The young and vigorous men discovered that their camp was made in a plain below a splendid mountain range that could be reached between two canyons, one to the north, the other to the south.

These gulches led to the Comstock, and they were natural concentrators of the metals removed from the outcrop of the lode by erosion. The most northern gulch forked within two miles of the lode, forming the Six Mile and Seven Mile canyons. Six Mile ends at a point just below a massive outcrop; at the end of it, free gold and silver sulphides were found by prospectors on June 8, 1859. Prior to this date the placer miners had followed the gold up through Gold canyon, through the present site of Silver City up to Gold Hill, so that by 1859 the Comstock lode had been reached from both sides.

The value of the silver sulphide was not discovered at once as it was an unknown black metal to all of the prospectors. When the value of this ore was disclosed silver mining sprang into being and moved forward rapidly. The rich gold and silver ores were shipped to San Francisco, while experiments were being tried on the Comstock and at San Francisco on all sorts of processes and devices for the recovery of the metals. The mining companies themselves undertook the reduction of their ore with an equipment whose magnificence was only equalled by its inefficiency. To this work can be credited the imperfect and costly treatment of the Comstock ores that has lasted until the present day. Shrewd men built mills and as a result of their joint efforts the Washoe process was evolved. When this process had been established as the one best adapted for the reduction of the ore, the profits derived from milling were so large that powerful milling companies were formed and any effort to treat their own ores by the mining companies was effectually discouraged.

The Washoe process is the American form of the Mexican Patio process and is used in the following way: The ore is crushed wet in 5-stamp mortars to a fineness ranging from 20 to 40 mesh; the crushed ore is then settled in square vats on the pan-floor; the finest of the slime is settled in a reservoir outside of the mill. The pulp, after settlement, is charged into fast-running grinding pans holding a charge ranging from one to two tons; the pans are either steam-jacketed or arranged to take live steam into the charge; the ore is kept at such a consistence as, with a motion in the pans, will keep the quicksilver in suspension in the charge. The chemicals used are bluestone and salt. The treatment lasts from three to six hours in the pans, which are finally discharged into settlers (a pan of slower motion, to which large quantities of water are added) to insure the settling of the quicksilver with its gold and silver. The pulp is slowly discharged from the settlers, the quicksilver recovered and strained to secure the gold and silver amalgam, which is then ground in a clean-up pan to remove all impurities, re-strained, and retorted; the resulting crude bullion is melted into bars of fine metal.

The equipment is as follows: For ten stamps of 900 to 1,000 lb. each four standard 2-ton pans are required,

together with two settlers and a slow-motion clean-up pan, retort, assay-office, etc. The actual horsepower required would be 60, but to provide for extra rock-breaking service, or a modification of the process, it is well to provide 75 for the work.

Such a mill will treat from 30 to 40 tons of ore per day at a cost ranging from \$3 to \$7 per ton, depending upon the loss of quicksilver, cost of water, power, etc. In the treatment of the ore such a mill will use 50,000 gal. of water per 24 hours, about 50% of which can be settled and used over again when water is expensive. Plate and battery amalgamation is being used successfully. The free gold contained in the ore is amalgamated and recovered upon silvered copper plates before the ore reaches the settling vats; after passing over these plates the ore is treated by the Washoe process as already described. In ores containing heavy sulphides, it has been found that by removing these sulphides before treating the ore in amalgamating-pans, a higher percentage of the metals is recovered at a reduced cost. Any type of concentrator that will remove the sulphides can be used for the work.

With the Washoe process established, the production of gold and silver bullion from Comstock ores was rapidly increased. In 1860 the yield was gold \$550,000, silver \$200,000; in 1861, gold \$2,500,000, silver \$1,000,000; in 1864, gold \$6,400,000, silver \$9,600,000; in 1869 the output of gold and silver dropped to \$7,405,578; from 1870 to 1877 there was a rapid increase culminating in the last named year with a grand total of \$14,520,614 gold and \$21,780,922 silver, or a total of over \$3,000,000 per month in gold and silver from the Comstock mines. From 1879 to 1895 the output varied from \$7,000,000 to \$1,000,000; from 1896 to 1899 there was a steady decrease until in 1899 the output was less than \$200,000.

The total output of the Comstock in gold and silver to the end of 1902 is close to \$371,000,000; of this sum there was about 60% silver and 40% gold. Besides the amount thus recovered, the losses are estimated at about \$60,000,000 and \$80,000,000, respectively, of which modern methods would have saved 70 per cent.

The discovery of the silver sulphides having been made by placer miners it was some time before the nature of the lode was understood. The first ore was found in small westerly dipping veins that connected with great masses of ore; these turned when nearing the easterly dipping foot-wall, the main fissure following this wall to a depth of 3,200 ft. below the surface. The great riches of the Comstock created intense excitement throughout the world, so that in a short time every country was represented on the spot by men interested in some phase of mining. Added to them were the speculators and gamblers. The result of their combined efforts was to cover the surface of the earth with hundreds of mining locations, for the speculators and gamblers soon discovered that mining claims had a speculative value. The main lode was soon outlined and reduced to ownership by many companies.

The high wages that were paid to the miners and mechanics attracted the most skillful of these men from the ends of the earth. The managers were thus enabled to meet the unusual difficulties of mining large bodies of ore, handling large quantities of water, and opening up new ground where the temperature was unusually high. All of these difficulties were fairly met. The quartz miners of the Comstock had penetrated the lode to a depth of 3,000 ft. within 20 years of the discovery of silver sulphides on the surface. Within that time the simple hand-windlass had been superseded by more and more powerful machinery until direct-acting hoisting engines of 1,000 hp. were being used. These engines were de-

signed for work to a depth of a mile below the surface. An adit (the Sutro tunnel) was started and connected with the lode from a point in the valley of the Carson river four miles distant, thus forming a new base of operation 1,600 ft. below the surface. Powerful pumping machinery was installed at various points.

During these years of intense activity the Comstock mines were controlled by individual owners or by small numbers of men with headquarters at San Francisco. The properties were irregular in size and in the number of shares that represented them. The stock of these mines was regularly bought and sold, so that the controlling ownership often changed; but the policy of those in control was always the same: to make the most money possible out of the mines in the shortest possible time, either by manipulating the stock, or by working the mine, or by both. While the management of the mines was generally capable, the spirit of the gambling speculator dominated the situation, and when, after a splendid dash at attaining great depth the workings were threatened with hot water, a retreat was ordered and 1,700 ft. of partially developed ground was abandoned. The reason for this was the fact that no unity of interest had ever been acknowledged by those in control of the various mines on the Comstock, and even science failed to give a reasonably definite statement of what might be expected in depth.

As a vertical depth of 3,300 ft. was reached before the lower levels were abandoned, it was several years before the water again rose to the level of the Sutro tunnel. During these years many millions of dollars were extracted from orebodies that formed the margins of the old bonanzas. It is one of the remarkable features of these orebodies that they begin and end in quartz bodies, quartz being the matrix in which the ore is found, forming a central core or lens surrounded by low-grade quartz. During the mad rush to extract rich ore the heart of the bonanza was literally torn out of its quartz body and in every instance where a bonanza was mined it has paid to work the ground again. It is also true that in several instances a greater tonnage was extracted during the second period of mining than during the first, even when it was not possible to explore the ground thoroughly. Had a more conservative and rational system of mining been adopted, there can be no doubt that many of the Comstock mines would have continued to pay dividends for many years, and that the bullion production would have been much greater.

By the year 1898 the condition on the Comstock was nearly hopeless. Many of the mines were abandoned; ruin and decay were prominent. At this period a few men succeeded in getting together the loose ends of the many interests and in convincing those in control of them that to save the Comstock from complete abandonment a united effort must be made to recover the lower levels of the lode. They were so far successful that a provisional and temporary union of all Comstock interests was formed by 28 mines forming the Comstock Pumping Association. The operations of this Association were successful.

The device used for draining the mines is a modified hydraulic elevator designed to work under a head of 2,000 ft. and over. Using water under such great pressure brought forward problems in hydraulics that are not yet solved. Before \$100,000 had been expended more water was discharged into the Sutro tunnel than had been discharged by the \$5,000,000 worth of pumps formerly in operation. Shortly afterward it was decided to operate the mines by electric power. A company was formed that secured contracts for power paid in advance of delivery and the power plant was built. The plant is now in

successful operation delivering power that is used in mining, pumping, milling, and lighting from a generating station at a point on the Truckee river 33 miles distant from Virginia City.

Of late years there have been no startling developments on the Comstock. The discovery at Goldfield and mining through Nevada, generally, has served to hold the attention of the speculative public, to such an extent that the Comstock has nearly escaped notice. But recent developments to the west and south of the Comstock may serve to attract attention to the famous lode. At Silver City, an important discovery has been made, undoubtedly the result of patient effort, for Silver City has been self-supporting for many years, and judging from the appearance of this camp at the south end of one of the branches of the Comstock lode, Silver City looks as though it could sustain itself without assessments for some time to come.

Encouraging prospects have been found in American Flat, the south branch of the lode; these, if developed, will undoubtedly revive interest in a number of mines that have been practically abandoned for years. Just west and south of American Flat, there are excellent copper prospects that have not been developed, probably because they are so near the Comstock.

The only change in the Gold Hill mines is the change of management at the Yellow Jacket. The new managers are building a large concentrating mill to work the dumps and the ores that are known to exist in the mine, but to be successful they must add a cyanide plant to their concentrating works. At the Ward Combination shaft, there is a struggle between hot water, hot air, and human endurance to get below the 2,560-ft. level. At this shaft, interesting, and what seems to be satisfactory, results were obtained with a light Starrett pump. A station is being opened on the 2,400-ft. level to install one of the series of powerful electric-driven piston-pumps on hand at the Ward shaft. Extensive repairs are being made in the Sutro tunnel. Encouraging developments have been made from the Sutro Tunnel level in the Hale & Norcross and Savage mines. Work is being planned for the Best & Belcher on the tunnel level. Tributaries are still able to find ore in the Chollar Croppings. North of the Con. Virginia, all the work is confined to the east vein (which has yielded all the ore extracted since 1904) or a search for it, and no work is being done on the main lode.

To the Butters plant there has been added a modern 20-stamp mill, with table and belt concentrators, sizing devices, and tube-mills for re-grinding the coarse tailing before cyanidation. The Comstock now possesses a complete modern reduction plant that can recover at least 90%, but, unfortunately for the Comstock, this modern mill is not treating the output of the Comstock but outside ores from Tonopah that are delivered to the mill from the Virginia & Truckee Railroad by an aerial tram.

Work in the long tunnel driven into Mt. Davidson by the Hale & Norcross has been temporarily stopped at a very interesting point; there is a good stream of hot water now flowing out of the adit from a westerly dipping formation. The latest geological work on the Comstock, in which appears an account of the formation passed through by the Hale & Norcross tunnel, is given in John A. Reid's paper 'The Structure and Genesis of the Comstock Lode' published by the Department of Geology of the University of California. It is to be hoped that work on the Hale & Norcross tunnel may be resumed and the adit extended at least 1,000 ft. farther west and that the work now being done to the east of the main lode will serve to attract such attention to the main lode that rational development work will be resumed.

Rapid Hoisting With Light Equipment.

Written for the MINING AND SCIENTIFIC PRESS
By GEORGE A. PACKARD.

The visitor to the zinc-lead district of southwestern Missouri, who is accustomed to the almost continual ringing of signal-bells in the shaft-houses of the West, is struck with the quiet system, and wonderful rapidity with which the hoisting is accomplished at some of the mines in the vicinity of Joplin. For those unacquainted with the district it should be said that the ores occur in beds of limestone and chert, lying nearly horizontally, and rarely at a depth of over 400 ft. Until within a few years mining was confined to the pockets of richer ore and was done almost exclusively by lessees. As the lessees also operated their own mills, the mining and milling machinery was naturally rather crude, being constructed with a view to small first cost and possible removal.

With higher prices for spelter has come the development of large bodies of low-grade ore in the 'sheet ground,' company management, and larger daily production from a single shaft. Yet hoisting with a bucket, or 'can,' as it is locally termed, continues to be the usual practice, though the mill has a capacity of 400 tons or more. Perhaps one reason for this is found in the fact that the mills are placed close to the shaft so that no tramping of the ore is necessary after hoisting.

The hoist at the plant of the American Zinc, Lead & Smelting Co., and the results attained, may be considered as typical of the advanced practice.* The hoist is driven by a vertical engine having a single cylinder of 8 in. diam. and 7-in. stroke, under 120-lb. steam, using a double exhaust. The cast-iron pinion commonly furnished is replaced by one of rawhide, giving longer life to the gears. The single drum, loose on the shaft and driven by a clutch of the band type, is 18 by 18 in. as furnished, but is lagged up to 24 in. diam. This machine is hoisting from a depth of 320 ft., and I saw the round trip made in 42 seconds. This speed is kept up for long periods, and I was told by the manager that 620 buckets had been hoisted through the single-compartment in a 10-hour shift, of which three-quarters of an hour should be deducted for dinner. This means an average of 67 buckets per hour, or more than one each minute for an entire shift. To accomplish this only two men are necessary. The buckets, which hold from 850 to 1,000 lb., are delivered by the trammers to the station at the level. One man does all the work here. He pushes the first full bucket into place; the empty is dropped and detached; the full one is hooked on and hoisted. Before the latter is dumped and lowered the empty has been delivered to a sidetrack, from whence it is taken by the trammers, and another full bucket is ready.

On top, the hoisting engine is placed close to the line of the shaft, though at a considerable distance above the ground in order to gain dump-room. The engineer stops the bucket, hooks on to the bottom, and dumps it in the usual manner. He then detaches the hook, lowers the bucket, and after a few seconds starts hoisting again. No signals are given. The engineer simply waits what he knows is a proper time for the empty bucket to be replaced by a full one at the bottom. Then he raises the bucket about six feet, holds it for a second while the man below stops the swinging and gets it in line with the vertical shaft, and hoists as rapidly as possible to the top. The speed of the rope reaches 1,250 ft., and averages 1,100 ft. per minute. In spite of this speed the bucket is almost invariably stopped at exactly the point for attaching the dumping hook. The entire leeway between the top of

the well and the sheave is only 10 ft. Of course, signals are used in handling men, timbers, and supplies; and the hoist is made extremely small, and with abnormal wearing surfaces, to stand this service.

The Prospector.

Enquiries sent to this department are answered free of charge, if submitted by subscribers who are not in arrears. The full name and post-office address of the sender must be given, otherwise no answer will be made. Those who are not subscribers must accompany their questions with a fee of \$3 for each question. No assays are made.

H. W., of Paris, Cal., sends a piece of Chalcedony.

The specimens sent by T. L. G., of St. Louis, have not been received.

Two Chalcedony pebbles were sent by F. A. F. of Tehachapi, California.

B. W., of Challis, Idaho, sends a specimen of Limonite, the hydrous oxide of iron.

The specimens sent by C. W. E., of Ashland, Ore., are: No. 1 and 3, Carbonaceous Shale; No. 2, Chlorite and Clay.

A specimen of Limestone containing small pyrite crystals was received from S. S. S., of Winthrop, California.

The specimen from Bearmouth, Mont., marked J. S., is rock stained with the red oxide and the green carbonate of copper.

The specimens from Pasto, Porto Rico, marked M. L. M., are: No. 1, Diabase with copper oxide stains; No. 2, Chloritic rock; No. 3, specular Hematite.

The specimen from Girdwood, Alaska, marked G. D. H., is a basaltic rock containing crystals and streaks of pyrite which may carry gold or copper. An assay is necessary to determine its value.

The samples sent by M. C., Silver Hill, Ariz., are: No. 1, Quartz, Feldspar, Garnet, and Pyrite; No. 2, Quartz and Feldspar with specks of bornite and chalcopryrite; No. 3, an altered volcanic, apparently a rhyolite; No. 4, Hematite in garnetiferous rock; No. 5, amygdaloidal Andesite with a copper phosphate, probably Libethenite; No. 6, altered Porphyry stained by hematite; No. 7, Quartz Porphyry.

The large share which manufactures form in the exports of the United States to all parts of the world except Europe is shown by an analysis just completed by the Bureau of Statistics of the Department of Commerce and Labor. These figures show that manufactures formed 86% of the exports to South America in 1906, 85% of the exports to Oceania, 75% of the exports to Asia, 66% of the exports to Africa, 62% of the exports to North America, while even to Europe manufactures formed 27% of the total domestic merchandise sent in the fiscal year 1906. This general group, 'manufactures,' upon which the above percentages are based, includes both manufactures ready for consumption and manufactures for further use in manufacturing. The first group includes all manufactures in the fully completed form and ready for immediate use. The second is made up chiefly of chemicals, leather, naval stores, lumber, copper in pigs, bars, and ingots, and various grades of iron and steel which have passed through a process of manufacture but are to be further used in manufacturing, such as steel bars, billets, ingots, blooms, sheets and plates, tin plate, wire rods, and pig iron.

* The hoisting-engine is of the type made by the English Iron Works Co., of Kansas City.

Transport of Machinery in Mountainous Countries.

Contributed by H. H. KRESS, of the A. S. Cameron Steam Pump Works.

American capital is being constantly invested in many



Burros on the Trail.

promising enterprises throughout Mexico, Central and South America. Only recently, the U. S. Consul General at Mexico City estimated that during the last four years \$125,000,000 of American money had been invested in the

mines of Mexico alone, while in other industries the investments are also very large.

The greatest percentage of capital, however, is invested in the mining industry; as, indeed, it was owing to the discovery of precious metals in the various parts of these

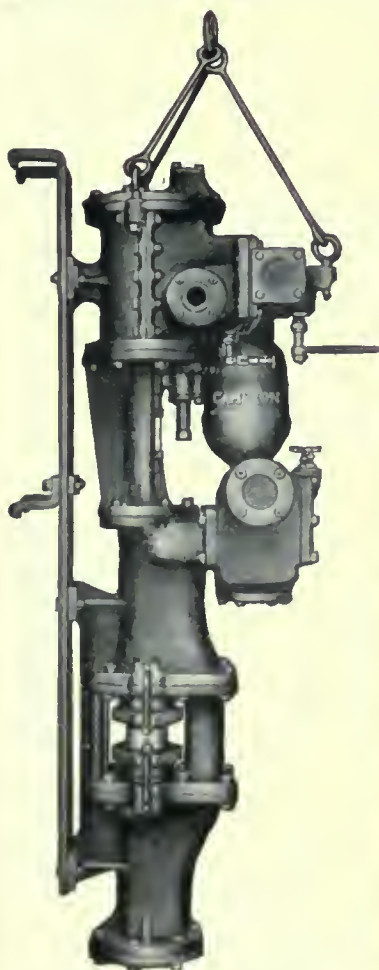
ous districts, there are still a large number of mining camps without close railroad facilities; and in some places, the settlements are many miles from a railroad. Transportation is costly and the methods, in many places, are crude; in some parts, merchandise and machinery are carried only on ox-carts; although in western Mexico, the burro or donkey is a most important factor, and is preferred on account of being quicker and safer in the dangerous mountain passes. Thus the traffic between the railroad and the interior is largely done on burro-back. These little animals are worth from \$12.50 to \$20 apiece. They average about 500 lb. in weight and will carry up to 300 lb., traveling from 20 to 40 miles per day, according to the condition of the country.

The machinery used in these mining countries is often specially built to suit this mode of transport; and it must be designed and built to allow for dismantling, so as to form a load of moderate weight for an animal to carry.

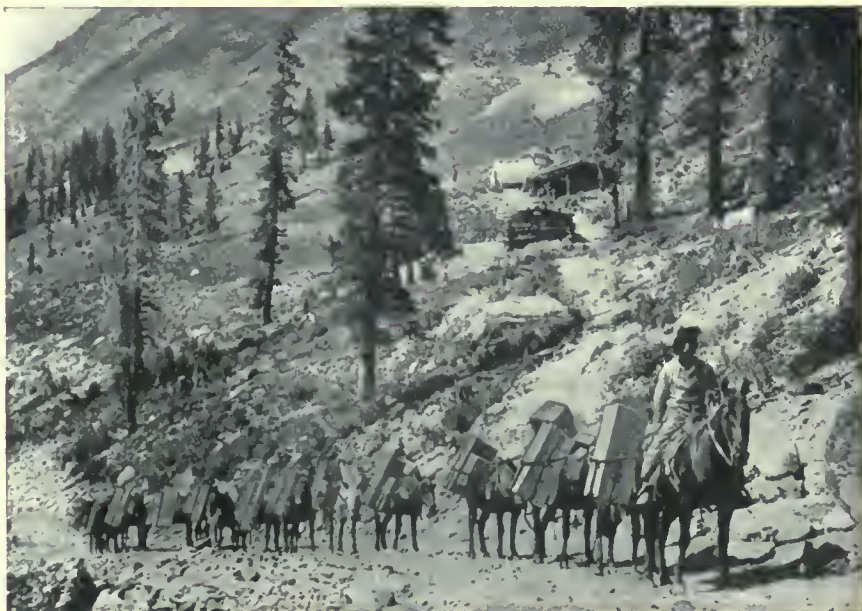
We give herewith two illustrations of mule-teams loaded with sectionalized Cameron pumps; also illustration of one of these pumps as it appears when put together. This type of pump has been adopted almost exclusively for the mountainous regions, and has found its way on mule-back and some-

times by more primitive modes of transport, over the mountain passes and terraced ranges of our own country and old Mexico, Colombia, Peru, and Chile, as well as into other mining regions of Central and South America.

These Cameron pumps are built for the heavy work and rough service to which they are usually subject in mining work. They are built in sections, the parts being so designed and proportioned that the pumps can be taken apart at the bolted joints, and packed for shipment. The majority of pieces weigh less than 150 lb., while the maximum weight, 300 lb., is rarely found, and only in the larger sizes. The parts are so arranged and marked that they can be readily assembled and the pump set up without the aid of a skilled mechanic; and every pump that leaves the Cameron works at New York is thoroughly tested to a degree far in excess of its rated capacity. The Cameron shipments from New



Vertical Plunger Sinking Pump, 'Sierras Pattern.'



Pack Train Carrying Mining Machinery.

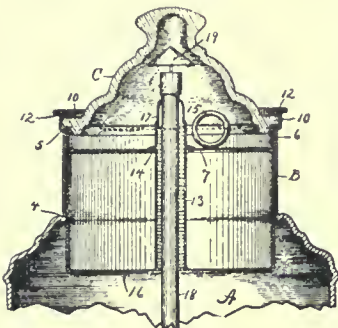
countries that settlers were led to exploit other resources; thus, new mining camps, and towns were created and are growing rapidly with the new industries. This industrial development makes a constant demand upon machinery and equipment, the larger portion being supplied by American manufacturers. In the interior and in the mountain-

York, destined for long journeys, are arranged for convenient handling, being strongly and securely boxed, on account of the numerous transfers of freight in steamship and railroad traffic before they reach their destination. The arrangements for mule-back transport must usually be made at some convenient station on the line of a railroad or other carrier.

MINING AND METALLURGICAL PATENTS.

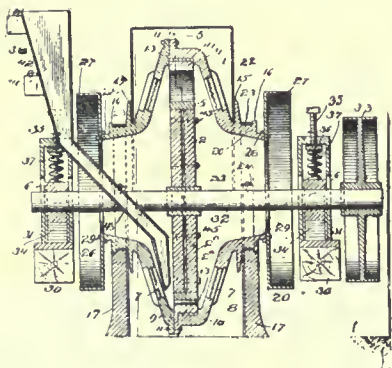
Specially Reported for the MINING AND SCIENTIFIC PRESS.

PERCOLATOR. No. 866,985; Charles E. Trehwella, Forestville, Conn., assignor to American Silver Co., Bristol, Conn., a corporation.



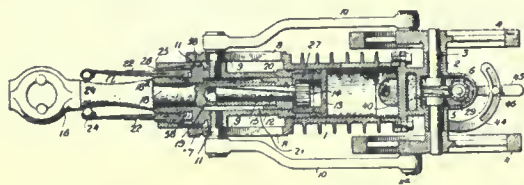
In a percolator, the combination of a cup having a perforated central overflow tube extending upwardly from its bottom and provided with a contracted tip at its upper end, with a fountain tube of a smaller diameter than said overflow tube and extending upwardly through the said overflow tube and its contracted tip, the smallest diameter of which is approximately the same as that of the said fountain tube, and a finely perforated retainer fitted to the upper part of the said cup and overflow tube, the perforations in which tube permit an excess of liquid to flow from the retainer into and down through the said overflow tube.

ROLLER-MILL. No. 866,799; Edgar S. Moulton, Central City, Colorado.



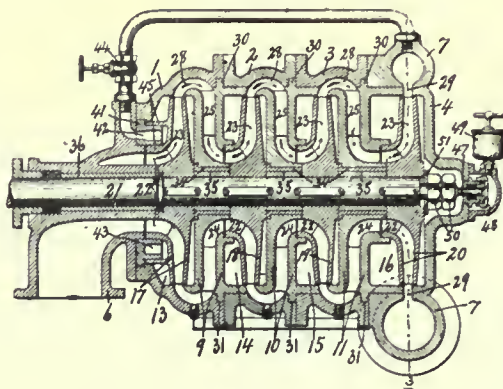
In a mechanism of the class described, the combination with a supporting frame, of a lower casing positioned within said supporting frame, a drum carried by said supporting frame, said drum provided with a plurality of flanges upon each side, removable bands secured to said supporting frame and positioned between the flanged portions of said drum, and an auxiliary wheel positioned within said drum.

HYDROCARBON ROCK-DRILL.—No. 863,646; John V. Rice, Jr., Edgewater Park, N. J., assignor of one-eighth to Albert Edward Tower, Poughkeepsie, N. Y., and seven-eighths to Fred E. Tasker, New York, New York.



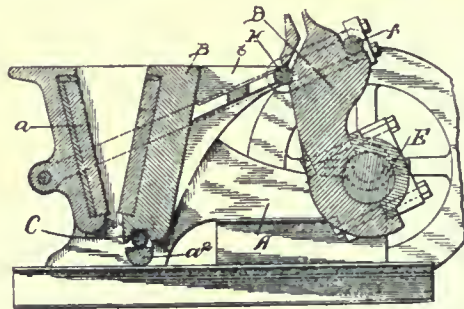
In a rock-drill, the combination of a cylinder, a piston therein, a piston rod having a movement with the piston and a secondary movement inside of the piston, means carried by the piston for imparting a rotation to the rod, and elastic means connecting the piston and piston rod, consisting of a yielding rolling device on one element engaging a curved face of the other

CENTRIFUGAL HIGH-PRESSURE PUMP.—No. 865,504; Carl Lager, Baldwinsville, New York.



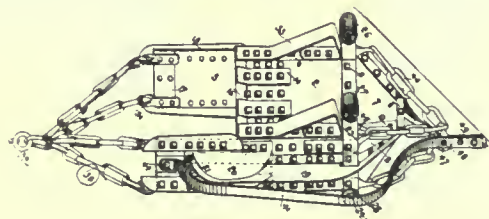
In a series-runner centrifugal pump, a series of separate annular case-sections one for each runner and means securing them end to end, each case-section having an annular waterway arched transversely, separate circular diaphragms interposed between and held by the meeting faces of the case-sections dividing the interior of the case into runner chambers and each provided with a water-passage leading from its periphery inwardly through one of its end faces, and a runner in each chamber having its inlet communicating with the waterway in one of the diaphragms and its outlet opening into the waterway of its case-section, said runners having their inlet openings all facing in the same direction, and an external conduit connecting the waterway of one of the case sections with the inlet side of one of the runner chambers and discharging against the inlet side of the first runner of the series.

CRUSHING-MACHINE.—No. 863,833; Morton G. Bunnell, Chicago, Ill., assignor to The Western Wheeled Scraper Co., Aurora, Ill., a Corporation.



A crushing machine, comprising a stationary jaw, a movable jaw arranged to oppose said stationary jaw, a pitman actuated at its lower end by an eccentric device, a swinging yoke having one end connected with the stationary jaw and the other end connected with the upper end of said pitman, and a toggle joint connection between the movable jaw and the upper end of said pitman, said connection consisting of an arm rigid with the movable jaw but pivotally engaging the pitman, and the toggle joint being adapted to break joint both above and below the centre during the up and down movements of said pitman.

SECTIONAL DREDGER-BUCKET. No. 866,971; Harley L. Sherwood, Oakland, California.



An excavating bucket provided on the outside of each of its narrow sides with a keel to cause the bucket to automatically recover its operative position when tilted

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TABLE OF CONTENTS

Editorial:	Page.
Notes.....	473
Copper.....	474
Professional Customs.....	474
By the Way.....	475
General Mining News.....	477
Special Correspondence.....	482
Salt Lake, Utah.....	Johannesburg, Transvaal
Leadville, Colorado.....	Toronto, Canada
Mexico.....	Butte, Montana
	Denver, Colorado
Concentrates.....	488
Discussion:	
Professional Customs...T. S., Courtenay De Kalb,	
...R. Chester Turner, H. D. S., George E. Collins	489
Weathered Pyrite.....Arthur S. Eakle	492
Articles:	
California Miners' Association.....	476
Rules for the Guidance of Employees Underground	
.....R. Chester Turner	493
The Desert Mill.....A. R. Parsons	494
Use of the Divining Rod.....	500
Mining in Australia.....W. J. Loring	501
Mining and Metallurgical Patents.....	502
Departments:	
Personal.....	476
Market Reports.....	476
Publications Received.....	504
Catalogues Received.....	504
Commercial Paragraphs.....	504

Editorial.

THE CALIFORNIA MINERS' ASSOCIATION will meet in annual convention on November 25 in San Francisco. The official call appears on another page of this issue.

IT WILL shortly be known that Mr. Hammond has resigned his position as advisory engineer to the Guggenheims. This step, we regret to say, is due in part to ill health. Mr. Hammond will go to Santa Barbara for the winter. It is most likely that he will be succeeded by Mr. Pope Yeatman. At the same time we have reason to know that Mr. A. C. Beatty will shortly sever his connection with the Guggenheims and become associated with Mr. R. D. Evans of Boston.

CYANIDATION is being used on an increasing scale in Nevada. We take pleasure in publishing an excellent article on the new mill built at Millers, in Nevada, by the Tonopah Mining Company. The author is the superintendent, Mr. A. R. Parsons. The plant was erected by a San Francisco firm, C. C. Moore & Co., with Mr. John H. Hopps as consulting engineer. The Desert mill—as it is named—includes the most advanced practice in cyanidation and is said to be giving good results (88 to 90% extraction) on a gold and silver ore of a type not usually considered particularly docile.

AMONG the unreasonable demands of labor-unions is that of the men working on the power plant which transmits electricity from California to Nevada, that is, from the source of energy in the Sierras to the mines at Tonopah and Goldfield. On the California side, where living is cheap and comfortable, the men get \$2.50 to \$3 per shift when engaged in grading for a new unit and in similar work, while on the desert of Nevada, where living is expensive and arduous, they get \$5. A strike is threatened by reason of the demands of the labor agitators that the men in California, who can live for \$15 per month, shall receive the same wages as those in Nevada, whom it costs \$50 per month to meet the bare expenses of living. In fact, the labor union is very much like the metal brokers of the Amalgamated Copper Company; both appear to consider economics a dismal science and unworthy of respect.

IN REFERRING to the apology of the Standard Oil Company as conveyed in a pamphlet of 30 pages, the *Financial Times* remarks that 26 pages are devoted to favorable statements taken from newspapers, and it is amazing that the company "should think the public will regard this as evidence above suspicion." This is fair comment. We are glad to assure our contemporary at London that the public in America is fooled most of the

time, but not all the time, and not by everybody. For instance, the only Californian paper quoted by the Standard Oil in vindication of its piratical methods is a small local sheet of which we never heard before, and having regard to the fact that the press of San Francisco can be subventioned with notable facility, and that the Southern Pacific Company finds it easy to prostitute most of the newspapers of the State, it is manifest that the ease of the Standard Oil must be bad indeed.

CALLOUS as Wall Street is to the revelations of predatory finance, the disclosures made in the street railway investigation at New York have proved startling. Not only have enormous sums of money been stolen, but the methods employed have been brazen beyond precedent, even in traction grand larceny. The life insurance scandals look half respectable in comparison; only the deeds of Tweed and his gang afford any parallel. We who live in San Francisco have a traction scandal of our own and if it is on a smaller scale, it is no less mean and sordid. Philadelphia, St. Louis, and Chicago are in a similar plight. No wonder the author of 'The Man of the Hour' laid the scene in "any large city in America," and the time, "today," for whether the audience is in New York, Chicago, St. Louis, Philadelphia, or San Francisco, they feel quite sure, as they see the play, that it must have been written to represent the corrupt conditions obtaining in their own city. The symptoms are not local; they indicate the poisoning of the body politic, with extreme bad health due to an industrial debauch and the intoxication of stock speculation.

Copper.

THE ATTEMPT of the metal brokers of the Standard Oil-Amalgamated coterie to peg copper at a price higher than market conditions warranted, has proved a glaring example of the smartness that is not wisdom and the business shrewdness that over-reaches. These abortive regulators of a world-wide industry are being damned from one end of this continent to another, for to their vagaries is chiefly due the demoralization of the market for copper. Of course, there has been a great falling off in consumption, commencing in March last, but there would have been no such débâcle as we have seen lately if the price had been lowered in accordance with the logic of facts. Instead, an attempt was made to maintain a high price artificially and for a long period. The net result is that copper sells at 13 cents. However, a great deal of interest is now being shown by the actual consumers, and during the past fortnight an increasing business has been done, although the largest consumers have persistently remained out of the market. Evidently, they intend to use the last pound of metal before purchasing, and the longer they can hold off the cheaper they will get their copper, but the moment they enter the market the turning point will have arrived. The Chinese have been buyers of late, and it is estimated that they have purchased some six or seven million pounds altogether. This counts for a great deal in times like

the present, and it may help to prevent further depreciation. It is our opinion that prices have gone lower than was necessary or justified, as usually happens in periods of panic. If we are not at bottom, we are very close to it. The large reduction in production decreed by the Amalgamated and Cole-Ryan interests will no doubt have its effect in due time, say, in three months. W. A. Clark will, we understand, also restrict his output by 50 per cent, and the mines in Sonora are curtailing production, besides scores of smaller companies everywhere. Mines based on 25-cent copper had better be closed down, but companies that can make a profit with the metal at 15 to 18 cents can afford to be patient, and spend the next three or four months in development work and repairs. During the interval the consulting engineers will have a chance to read their accumulation of technical literature, neglected during the boom.

Professional Customs.

IN a recent issue a young mining engineer presented a series of questions relating to the customs usual in professional work, more especially the examination of mines. These questions were made in good faith by one who really wanted to have some guidance in these matters. We published his request for information and then asked a dozen mining engineers to send replies to the ten queries propounded by our young friend. Some of these answers we publish this week, others will appear hereafter.

Obviously some of the questions are elementary, but they are also basic, as involving the rudiments of a professional code. Some of them may be thought unnecessary, but they happen to relate to points concerning which an earnest fellow really wants information, so they have a significance. Frankly, we are glad to ventilate a subject so practical, for assuredly a right code of conduct is as practical a matter as the erection of a stamp-mill or the sinking of a winze. It is not likely that we shall ever have perfect agreement as to the principles at the foundation of the right regulation of professional conduct—that is, ethics. The work done by mining engineers is so diversified, the conditions under which they work differ so widely, the preliminary training of the members of the profession is so unlike, that no one will dare to lay down laws, for who can be the judge? Certainly, not engineering societies of nondescript membership nor college faculties of mixed composition. Nevertheless, as intelligent men, as citizens of more than average education, as members of the community entrusted with more than average responsibilities, we ought to have some notion of the right and wrong involved in our relations to clients, to workmen, and to each other; it may not be possible to study duty as a science, but it is possible to develop ideas that may become second nature, a glorified habit capable of guiding us among the deep waters of finance and the shallows of promotion.

The time was when there were three professions, namely, religion, law, and medicine. These were the 'learned' professions and they ranked immediately after

the army and the navy in social precedence. Even in ancient times the three professional occupations were well recognized. As civilization has advanced in complexity, other professions have been differentiated and the original three have lost some of their primary characteristics. That of religion has become an avocation with some men, to others it is a business; the practice of law has suffered even more, so that while it has continued to enlist the most brilliant minds in all countries, it has also become the tool of every form of wrong doing, until, in this highly developed industrial civilization of ours, the lawyer has become distinguished chiefly for his ability to defeat justice and circumvent the law. The physician, also, although he retains best of all the characteristics we consider professional, has suffered in status, by the admission into the ranks of medicine of the charlatan and the quack, in many cases possessing the less desirable attributes of both the followers of religion and law, as though superstition and chicanery had met and kissed each other. Thus the original learned professions have lost cast to some extent, and not only by their own degradation but by the mere number of other so-called professions.

And what is a profession? It is an occupation that involves a liberal education, and mental rather than manual labor; hence it is a calling involving special mental and other attainments or a special discipline. So says the dictionary, and then it adds: "as editing, acting, engineering, authorship, etc." Which is humorous, for editors are born, not made, even if most of them ought to be dead and not living. Actors do not need to be liberally educated, even though the best of them are a liberal education, and as for discipline, the world usually regards them as an undisciplined crew, more akin to the genius of the artist than to the restraint of the soldier. Authorship nowadays is not understood to require special, so much as peculiar, mental attainment; and as for discipline, that is mainly the prerogative of the publisher. However, the main characteristics of a profession are a mental training and a special discipline, that is, the preparation for a specific form of mental labor and a sense of duty. A hod-carrier is a useful fellow, especially in San Francisco at this time, but he is the antithesis of a professional man, because his work requires no previous training, only muscular strength and ordinary willingness to exert it; his work consumes no brain tissue worth mention, for it is distinctly a physical performance; it calls for no recognition of discipline, except that of the walking delegate, which is a rudimentary form of authority; it involves no notions of conduct, it permits him to heave a brick at a tram-car during a strike without loss of self-respect; and it assumes not even the obligation of a contract, for the work of the hod-carrier is measured by the hours spent and not by the work done. In all of the points mentioned, the professional man is, or ought to be, as far as the poles asunder from the useful but ethically simple instrument of industry to whom we have referred.

Such as the hod-carrier is, he meets the requirements of his labor. Little is expected of him in an ethical way—save not to heave bricks at tram-cars—and therefore the possible best hod-carrier is not widely different from the

real man as we find him. In most respects his antithesis is the professional man—the minister, doctor, lawyer, architect, engineer, metallurgist, geologist, and so forth. The ideal hod-carrier is a possibility; the ideal professional man has only to be described to seem a creature too bright and good for this workaday world. He is a man that has received a special training, whether it be at the University or in the wider school of life itself does not greatly matter; he uses his brains, which by education he has made a logical machine capable of difficult thinking; he has undergone discipline and he is under discipline, the discipline of self-respect, of self-control, and of public opinion; he has notions of right conduct, notions implanted in youth and crystallized by contact with his fellows; his work is not measured primarily by the time consumed nor even by the trouble involved, but rather by the excellence of it; he has moral and intellectual faculties, which become developed as he grows older, and he has a tendency to use such faculties in a fixed direction—that is, he possesses character; he has a code, the unwritten laws of a highly civilized human being; indeed the professional man of the highest type has the inheritance of the old aristocracy, expressed in the motto "*Noblesse oblige*"—the compulsion to be honorable. He is the flower of a democracy and the best product of a people whose ideal is an equality of opportunity. "He is"—he *ought* to be. If he is not, it is because he aims too low, or because he has no aim at all, but drifts amid the flux of phenomena we call life. "We never see the target a man aims at in his life; we only see the target he hits."

RED CANYON is the name of a place in Wyoming prominent just now on account of a fiasco in placer mining. Such experienced miners as J. B. and Thomas L. Greenough of Missoula have been sold a salted mine and they are responsible for an ambitious scheme of promotion that has now broken down. It is fair to add that these well known operators have announced their intention to refund all the money subscribed by stockholders. How the gravel was salted is not known. The first samples from 42 pits and shafts yielded from 10 cents to \$9 per yard; on this showing the transfer of the property was made. Later examination and sampling gave no such results. Incidentally we may mention that Mr. Edmund Juessen, of Spokane, wrote to us severely criticising the data given in one of the promoter's reports, but we did not publish his criticism because it did not refer to anything previously mentioned in our columns. Mr. Juessen's inference that a gross blunder had been made, appears now to be fully confirmed. Only yesterday we were also informed that the Red Canyon tract had been offered to San Francisco operators and they had sent Mr. C. H. Munro to examine it. Not satisfied with the high returns obtained from the test pits he had panned the beds of several creeks that cut across the deposit, arguing that in them he would find a natural concentration of the gold, if the average gravel was as rich as stated. He used the sampling of nature to check the tampering of man. When his pannings gave poor results, he advised his clients to drop the business.

Personal.

THOS. H. LEGGETT is here.

J. M. BOUTWELL is at Cananea.

MARK L. REQUA is at Salt Lake.

LIONEL LINDSAY is at Guanajuato.

H. W. TURNER is here from Portland.

H. W. CARTRELL is at Bisbee, Arizona.

JOHN B. FARISH is here from New York.

R. H. BURROWS is in western Chihuahua.

J. L. BOSQUI has gone to Goldfield, Nevada.

E. M. NORRIS, of Salt Lake, is at New York.

L. C. GRATON is in Shasta county, California.

H. DEC. RICHARDS is at the Engineers Club, New York.

W. B. MILLIKEN, of Denver, has gone to Rhyolite, Nevada.

S. F. EMMONS has returned to Washington from Cananea.

FRANCISCO NARVÁEZ, of Pachuca, Mexico, is at Denver.

RENE DE SALLIER, of Atwater, Linton & Atwater, is in Colorado.

ALBERT W. JOHNSTON was married at New York on October 5.

THEODORE DWIGHT was married at New York on September 28.

EDWARD S. WIARD has left Denver to go to Spokane and northern Idaho.

J. NORTON GRIFFITHS has returned to London from Portuguese Angola.

J. D. KENDALL has his office now in Friars House, New Broad St., London.

F. L. BOSQUI has moved from Berkeley to the Crocker Bdg. in San Francisco.

F. H. MINARD, on his return from Cobalt, Ontario, has left Denver to go to Mexico.

C. EVERARD ARNOLD is working in the Smuggler-Union mine at Telluride, Colorado.

JOHN HAYS HAMMOND is expected at Santa Barbara, where he will spend the winter.

B. DRINKWATER is analyst and assistant manager of the La Tortilla works, at Linares, Spain.

E. H. NUTTER has been promoted to superintendent of the Liberty Bell mine at Telluride, Colorado.

C. T. GRISWOLD has been appointed professor of mining and metallurgy in Colorado College, at Colorado Springs.

LEE S. WOOD, of Denver, has been making an examination of the Green Mountain mine near Silverton, Colorado.

J. E. BRADLEY and F. A. SMITH, of Worcester, Mass., have been inspecting the Hercules mine at Silverton, Colorado.

ROBERT HAWKHURST, JR., has been appointed general manager for the Poderosa Mining Co., near Antofagasta, Chile.

O. E. JAGER has left for Australia, having accepted a position with the Great Cobar Copper Co. at Cobar, New South Wales.

H. FORBES JULIAN, of London, England, joint author of 'Cyaniding of Gold and Silver Ores,' arrived in New York on the steamer *St. Louis*.

CHARLES A. CHASE, general superintendent of the Liberty Bell, at Telluride, will move shortly to Denver and open an office as consulting engineer.

GEORGE S. BINCKLEY, manager for the Cia. Metalurgica y Refinadora del Pacifico, at Fundicion, Sonora, Mexico, has resigned, and has been succeeded by E. J. WILSON.

L. W. TRUMBULL has tendered his resignation as professor of mining in the University of Wyoming, to accept the supervision of properties in Sierra county, California. After December 1, his address will be Downeyville, California.

Latest Market Reports.

LOCAL METAL PRICES—Oct. 17.

Antimony.....	13@17c	Quicksilver (flask).....	\$44@41.50
Copper.....	18@20c	Spelter.....	7@ 7.75c
Pig Lead.....	4.85@ 5.80c	Tin.....	38@10c

ANGLO-AMERICAN SHARES.

Cabled from London.

	Oct. 9.	Oct. 16.
£. s. d.	£. s. d.	£. s. d.
Camp Bird.....	0 18 1½	0 18 3
El Oro.....	1 5 0	1 4 9
Esperanza.....	2 0 7½	1 18 6
Dolores.....	1 5 0	1 2 6
Oroville Dredging.....	0 15 7½	0 14 6
Tomboy.....	1 7 6	1 7 6

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

MINING STOCK QUOTATIONS—NEW YORK.

Closing Prices.

	Oct. 9.	Oct. 16.
Bingham Central.....	½	½
Boston Copper.....	13¾	11¾
Cumberland Ely.....	6¾	4½
Dolores.....	6	5¾
El Rayo.....	2¼	2¼
Guanajuato Con.....	27½	2½
Glroux Con.....	4¾	3¾
Greene Con.....	12	12
Nevada Con.....	9¾	7¾
Nipissing.....	6¾	5¾
Tennessee Copper.....	20	23
Tonopah Ex.....	1¾	1¾
Tonopah-Belmont.....	1¾	1¾
Tonopah.....	9¼	8½
United Copper.....	46½	16
Utah Copper.....	22	16

(By courtesy of Hayden, Stone & Co., 25 Broad St., New York.)

SOUTHERN NEVADA STOCKS.

San Francisco, Oct. 17.

Atlanta.....	\$ 26	Laguna.....	1.00
Belmont.....	1.42½	Manhattan Con.....	30
Columbia Mtn.....	22	Midway.....	69
Combination Fraction.....	1.00	Mizpah Extension.....	10
Daisy.....	55	Mohawk.....	10.25
Fairview Eagle.....	84	Montana Tonopah.....	1.75
Florence.....	2.75	Nevada Hills.....	4.10
Gold Bar (Bullfrog).....	39	Red Top.....	2.50
Goldfield Con.....	5.10	Sandstorm.....	20
Goldfield of Nevada.....	1.00	Silver Pick.....	27
Gold Kewanas.....	26	St. Ives.....	44
Great Bend.....	31	Tonopah Extension.....	1.50
Jim Butler.....	51	Tonopah of Nevada.....	8.50
Jumbo.....	2.50	Tramp Con.....	17
Jumbo Extension.....	97	West End.....	45

(By courtesy of W. C. Ralston, 368 Bush St.)

California Miners' Association.

In accordance with a resolution adopted by the Executive Committee of the California Miners' Association, Monday, November 25, has been selected as the date of the annual convention, to be held at the rooms of the California Promotion Committee, on Union Square, San Francisco, at 10 o'clock in the morning.

It is considered of importance that certain subjects of vital interest to the mining industry of the State should be thoroughly discussed, with a view to taking such action as may be deemed necessary. Among the problems of today are the location of mineral claims on forest reserves; the restriction of the area to be located under single ownership; the segregation of timber land and mineral land (especially as it arises at this time in northern California); the damage done by smelter smoke and the relation of the smelters to the mining industry; the work of the Debris Commission as it relates to hydraulic mining in the central watersheds of the State.

As it is expected that the discussions to take place before the Convention will be of the greatest importance to the counties in which mining is carried on, the supervisors of these counties will be asked to appoint delegates to represent them, in case the county has no regular miners organization. The Executive Committee has requested representative men in California to present papers on the subjects mentioned or on other subjects certain to prove of interest to the Convention.

W. C. RALSTON, President.

CHAS. G. YALE, Chairman Executive Committee.

General Mining News.

ARIZONA.

COCHISE COUNTY.

Martin Costello has optioned to Col. L. W. Powell his six claims in the Gleason mining district in the Dragoon Mtn. All the mines at Bisbee have been shut-down the last two Sundays.

The Shattuck-Arizona is still producing about 400 tons of ore per day; half of the ore, the oxidized, goes to the Copper Queen smelter at Douglas while the other half, the sulphide ore, goes to the Old Dominion smelter at Globe. Most of the ore comes from the 700 and 800-ft. levels, although some comes from the low-grade orebody recently found on the 900. The winze in the Leo claim, which is being sunk from the 800-ft. level is still in high-grade ore.—During the past week the Denn-Arizona has slightly increased its shipments. Development work is confined mainly to the orebody found on the 1,000 and 1,100-ft. levels, whence most of the shipping ore is coming. Last week the drift from the Higgin property into Wolverine & Arizona ground was pushed rapidly ahead so as to further develop the orebody which was discovered some time ago. After going through about 40 ft. of good ore the drift broke into an altered limestone formation. It is probable that the drift will be stopped and an inclined winze sunk on the ore.—The shaft at the North Bisbee has been retimbered and the new machinery has been installed. Sinking and driving have begun again. Although the Calumet & Arizona and the Copper Queen Co. have curtailed their output on account of the unsettled condition of the copper market, still the work at the various Superior & Pittsburg shafts has gone on as usual. Most of the output comes from the Cole shaft where the development of the orebodies is being pushed ahead steadily.—At the various Copper Queen properties a good many of the miners have been taken from the stopes and put on development work in the attempt to open up new orebodies.

GRAHAM COUNTY.

A good gold strike has been made on the Buzzard Shadow claim of the New York-Arizona Co. The streak, which is 3 to 9 in. wide, is quite rich. Near this mine the Gold Belt Co. is working a promising claim. The shaft is 200 ft. deep; the vein is 12 ft. wide and is of good grade, it being also a gold ore.—The output for September of the Shannon Copper Co. was only 1,60,000 lb., it being cut down owing to numerous delays in getting the new furnace started.

PINAL COUNTY.

Recent development work at the Ray mine, in which S. W. Mudd, of Los Angeles, is interested, has added considerably to the ore reserves. The mill, which has been remodeled, will start within a month. It will have a capacity of about 250 tons per day.

CALIFORNIA.

BUTTE COUNTY.

The fire, which started Oct. 10 in the transformer, burned over \$100,000 worth of property belonging to the Nevada Dredging Co. at Oroville. A new dredging company, to be known as the Butte County Con. Dredging Co., has been formed to dredge Butte creek.

ELDORADO COUNTY.

J. D. Crawford has purchased the Stillwagon mine in Grizzly Flat from F. M. Davis.—The Larkin mine near Diamond Springs is to be reopened soon.—The machinery of the River Hill mine is being moved to the Sherman mine which is on the same vein. The Sherman mine is working two shifts. Work is being done on four levels; the shaft is not quite 500 ft. deep.

INYO COUNTY.

(Special Correspondence).—Inyo county is at present experiencing quite an activity in the various mining districts. The warm weather being over the prospectors are getting out into the hills again and many new finds are being reported.—J. V. McConnell has just returned from

Eureka Valley, where he has been making an examination of the Grand View group of claims owned by Geo. F. McPherson and others. In an interview Mr. McConnell stated that Mr. McPherson's property looked very well at surface. On one of the claims he has followed the vein down for 35 ft., at which point Mr. McConnell's sampling shows that the ore averaged \$48 per ton in gold and silver. It is the intention of Mr. McPherson and his associates to push the development work this fall and winter.—M. H. Crane reports a new find about 12 miles east of Big Pine in the White Mountains of between 3 and 4 ft. of lead carbonates which run very well in lead and silver.—J. W. Wright is pushing development work on his lead property east of this place and expects to make a shipment of high-grade lead-silver ore this week. Mr. Wright is doing no stoping, but is simply shipping the ore that is taken out in development work.

Big Pine, Oct. 10.

NEVADA COUNTY.

The Lecompton, Treadwell, Freedom, and Daybreak mines in Willow valley have been optioned to the Bankers'



Map of California.

Trust Co. The Lecompton and Treadwell belong to the Opp estate, while Norton claims, as the Freedom and Daybreak are known, had been bonded to the late Karl Howard. The mines will be consolidated and the new company called the Lecompton Consolidated. The company is also negotiating for other claims in the vicinity of those already bonded. The pumps at the Lecompton have been started and it is expected that the mine will be pumped out by Nov. 1. At first most of the work will be done from the Lecompton shaft. The Bankers' Trust Co., which is composed mainly of Kansas City men, is also working the Austin mine at Willow creek and the Republic mine near Graniteville. It is the intention to add 10 more stamps and work the Republic mine all winter.

The Ethel mine, owned by Maltman, Grissel, Goodwin, Christian, and others, has just been sold to an Eastern company. Much development work has been done at the Ethel during the last few years.

PLACER COUNTY.

George Wingfield of Goldfield has bought the Cook ranch near Auburn. Mr. Wingfield intends to prospect the property in order to try and refind the pay-streak in the old gravel channel which runs through the ranch; work will begin soon.

SHASTA COUNTY.

Judge Head of the Superior Court has decided the suit in regard to the title of the Golinsky group of claims in favor of B. Golinsky, the original locator. The decision hinged on the location of a missing section corner. This group of mines is under bond to the Guggenheims.

Last week the aerial tramway, which carries the ore from the Balaklala mine to the smelter at Coram, was started. This tramway is five miles long and there are 64 towers; the longest span is 1,200 ft. The large oil-tank at the Balaklala smelters has just been completed; its capacity is 500,000 gallons.—The Washington mine above French Gulch has been sold to J. H. Porter, C. E. Gilzean, and others. This old mine was famous in earlier days; the first stamp-mill in Shasta county was erected at this mine.

SIERRA COUNTY.

The mining property of Richard Phelan has been optioned to Col. Stephenson of Olinhouse, Nevada, who represents Eastern capitalists. This property consists of 27 lode claims and 3,000 acres of placer ground. The lode claims consist of four groups all near the famous Sierra Buttes quartz mine. The placer claims are mainly along the Lost Channel branch of the big Blue Lead and are mostly drift mines.

SISKIYOU COUNTY.

The Quartz Hill mine at Scott Bar has just completed a three-weeks' run; the clean-up yielded \$500. At present the mine is being worked under lease by C. F. Leavenworth.—The California Consolidated Co., whose mines are in Eddys gulch, has bought the Salmon river ditch and intends to put in a hydro-electric plant just above Sawyers Bar. The company will employ from 50 to 75 men in the future. The company is developing its mines preparatory to starting their 20-stamp mill. W. H. Young is manager.—Developments at the Homestake are quite promising. A raise is being driven to tunnel No. 3 with tunnel No. 2. The ore recently discovered in No. 4 level is quite good with patches of high-grade stuff.

TRINITY COUNTY.

The dam on East Fork, belonging to the Enterprise mine, is being repaired. It is expected that work at the mine will be resumed this winter.—The vein, recently discovered at the Morning Star mine in the East Fork district, contains a streak 8 to 12 in. wide of good ore.

TUOLUMNE COUNTY.

The Driesam mine is again working. The shaft at this property is 400 ft. deep but is badly caved; it has been retimbered to hard ground and will be opened again to the bottom. Twelve men are working at this mine; J. E. Conde is in charge at the mine.—The shaft at the Uncle Sam, which caved last winter, has been retimbered. Considerable development work is being done.—The Duffield and Sonora mines have been bonded by Parkinson and Backes. A new vein on these claims was discovered this summer and a drift 100 ft. long has been driven on it.—The rich strike, made in the Hunter Creek district some time ago by E. Calwell, is still looking well. The vein is two feet wide and carries some free gold.

COLORADO.

OURAY COUNTY.

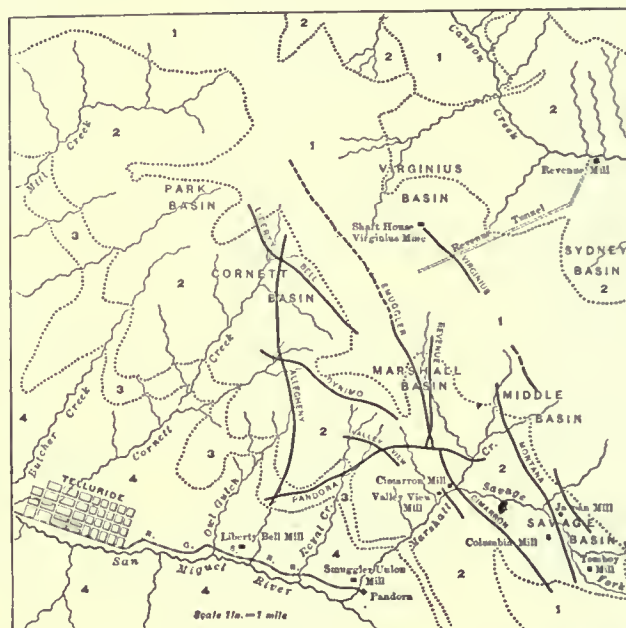
(Special Correspondence).—H. E. Procunier, manager of the Breen property in Poughkeepsie gulch, has recently overhauled the mill and new jigs have been installed. The mill now has a capacity of from 50 to 60 tons per day, and is run by Pelton wheels. Ingersoll and Hardsocg drills are used in development work. The main adit is in 1,900 ft. and is expected to cut the Consort vein within the next 225 ft. The Monarch adit, which is now 240 ft. long, has cut an ore-shoot 5 ft. wide; this adit will be extended in order to develop a second shoot which looks promising at surface.—The Revenue mill treats 45 tons per day, the ratio of concentration being six into one. This mill is being operated by lessees; each set—five in all—ship a car of concentrates each month.

Ouray, Oct. 11.

SAN JUAN COUNTY.

The Hamlet Co. recently opened up ore in No. 5 level, which is 300 ft. below all old workings. The ore carries gold, silver, zinc, lead, and copper. The mill consists of rolls, jigs, and Wilfley tables; the re-grinding being done by Huntington mills between the jigs and Wilfley tables. The capacity is 75 tons, but this will be increased shortly to 200 tons per day. W. E. Lloyd, the manager, estimates there is ore enough in the old workings to run three years besides the new ore-shoot recently opened, which gives 300 ft. more. Twelve machine-drills are in use; the Sullivan machines in the drifts and Waugh drills in the stopes. The property is on Galeana Mtn. on the line of the Silverton & Northern Ry., which operates between Silverton and Animas Forks. The mill is operated by electric power furnished by the Animas Power Co., while the compressor uses steam.—Experimental work is being done at the Green Mountain Co. in Cunningham gulch with a view to making some changes in the mill.

The Old Hundred mill is undergoing some slight changes. The mechanical dryers, used in drying the concentrate, are being removed and the concentrate will be run into a drain-



Not Classified	1 Rhyolites and Andesites.	Eocene	3 San Miguel Conglomerate
as to	2 San Juan Formation.	Jurassic and	4 Shales and Sandstones.
Geologic Age.	Andesitic Breccia.	Cretaceous.	

Sketch Map of Telluride District, Colorado.

ing bin where a certain amount of water is drawn off and the concentrate is shipped wet instead of dry as heretofore. This will save sacking and the loss unavoidable when such material is handled dry. It will do away with a man to look after the dryers and a man to sack the concentrate; as against this the difference in the freight rate between shipping the concentrate wet or dry is slight. In shipping dry the concentrate contained about 1½% moisture, while wet it will contain about 7%. A canvas plant will be installed. Sixteen Callow settling tanks were recently installed, and according to J. M. Elmer, consulting engineer, the tanks are doing excellent work. There is one 8-ft. Callow tank to each vanner. There are 18 Card tables in use in the mill and one James table. The mill contains 40 stamps and has a capacity of 180 tons per day. A Robins belt-conveyor brings the ore from the bins at the tramway station to the bins in the mill. Pierce amalgamators are used after the plates and in this plant, as in a number of other plants throughout the San Juan; they are giving most satisfactory results. The Silverton & Northern Ry. has a spur running from Howardsville to the mill in Cunningham gulch. A large amount of development work is under way in the mine. One Denver Engineering Works electric hoist, good for 1,500 ft., is being installed and will be used in lowering ore to the mill-level, which will do away with the aerial tramway. It will also be used in bringing material from the

lower or mill-level to the station. The main adit, which has already been advanced several hundred feet, will connect with No. 7 vein and will give 2,700 ft. depth. The Eclipse drill-sharpener in use in the blacksmith shop is also doing good work. Howell Hinds, of Cleveland, is president.—J. H. Kramer has a lease on the old Ledge mill and is running the old concentrate dump, which could not be shipped at a profit in the early days; he is making a high-grade lead product.—It is understood that S. S. Graham, Jr., of the Elk Co. will install a compressor and drills to operate the property owned by his company in the Red Mountain district on the Cement creek side. This company has 32 claims and is estimated to have 15 veins to cut within 3,000 ft. The adit is 450 ft. long and have tapped one vein of pyrite. The property is situated on the line of the Gladstone & Northern railroad, joining Silverton to Gladstone.—The Hercules mill has been operating steadily on ore from the mine of that name, and regular shipments of concentrate are being made by Thomas Kane, the manager.

The Kitimac Co., in Minnie gulch, is erecting a 10,000 ft. Trenton Iron Co. aerial tramway and recently installed a compressor. Two machine-drills are in use and another is to be added. A cross-cut is being driven to cut the Isabella vein and incidentally a blind vein about 180 ft. from the Isabella has been encountered; it is said to show 19 ft. of milling ore, out of which about 20% can be sorted by hand, giving an average of \$30 per ton. The concentrate will average \$50. A mill will be built in the spring. James Kelly is superintendent; J. T. Joyce is manager.

T. Jay Hurley, manager for the Precious Metals Co., is operating the Silver Crow group, and last year equipped the property with a 10-drill Rand compressor and drove the adit 1,500 ft. in nine months. The last 1,000 ft. of work is on the vein and several good bunches of ore have been found, but no shipments have been made as yet. The property is situated in Mill gulch, near Chatanooga.

The new Silver Lake mill is operated in two units, one handling material from the Silver Lake mine and the other the ore from the Aspen mine owned and operated by the same company. This mill was designed with a view to giving plenty of light to the men employed as well as to get the best extraction. L. O. Bastain is superintendent of the mill; C. T. Van Winkle is assistant manager for the company.

The Detroit & Colorado M. Co. has just finished the new upper terminal of their tramway connecting with the Rio Grande railroad. Ore is being shipped at the rate of 15 cars per month. This went to the Ross smelter at Silverton, but since that plant has been closed down other arrangements will be made. The ore will probably go to the Salida smelter. L. L. Haines is manager.—The Mogul, near Gladstone, is installing a roaster for magnetic work. The mill has been closed for the past two months, awaiting the installation of magnetic separators. It is intended to start the mill shortly on 150 tons per day capacity and later to add more jigs and other machinery so as to increase the capacity to 300 tons per day. A large amount of development work has been done in the mine and the ore-bins are full, waiting the starting of the mill. R. W. Hollis is manager.

Silverton, Oct. 12.

SAN MIGUEL COUNTY.

(Special Correspondence).—The shaft-house and other buildings at the Mayflower mine were burned recently. It is understood that the buildings will be rebuilt as soon as possible. The company has almost completed the aerial tramway, which is to deliver the ore to the mill, that they are building east of the Liberty Belle mill.—The Black Bear Co., operating in Ingram basin three miles east of Telluride, have finished their upper tramway and expect within three or four weeks to have the lower one, which carries the concentrates to the Denver & Rio Grande railroad at Pandora, also completed. Both are Leschen trams. Ten stamps have been added to their mill, doubling its capacity. The mill contains eight Card concentrators; Pierce amalgamators are used below the plates. Many Pierce amalgamators are being used in the mills throughout the San Juan and good

reports are made of them in each instance. The Black Bear ore carries lead, copper, zinc, and gold. The company expects to ship each day two tons of crude ore besides the concentrates. O. Mantyla is president of the company.—At present the Smuggler-Union Co. is mining considerable ore on company count and have ceased to renew leases as they expire.—Some additions and changes are being made at the Tomboy mill.—The Smuggler Co. is erecting a testing plant, and, in case this treats the ore satisfactorily, a much larger plant will be installed.

Telluride, Oct. 10.

IDAHO.

SHOSHONE COUNTY.

(Special Correspondence).—The Snowstorm mine, three miles east of Mullan, is developed by four cross-cut levels from the surface of the mountain, which are numbered 1, 2, 3, and 4, beginning with the highest level. The lowest of these, or No. 4, is now being driven. Work has progressed about 1,700 ft. and when finished it will be 3,100 ft. long. No. 4 is 1,500 ft. vertically below No. 1. The tramway from the mill to the mine has two mine terminals, one at No. 2 level and the other at No. 3. The bulk of the present tonnage comes from stopes between levels No. 2 and 3. The ore is mostly a copper carbonate and very silicious, the copper being extracted by leaching. A considerable tonnage taken from No. 3 level, however, is a sulphide, which, on account of being high in silica, is suited to the use of smelters for converter lining and the shipments have thus far been for that purpose. The lowest, or No. 4, cross-cut, it is believed, will open heavy sulphide ore. The leaching plant, in charge of Mr. Rogers, is handling about 175 tons of ore every 24 hours. The company has two air-compressors—one operated by water power and the other by electricity. Improvements at the mines and at the mill are of the best, the bunkhouses, dining-rooms, and bath-rooms being strictly modern, affording accommodations equal to those of a first-class hotel.—Shipments of concentrates and crude ore by the Federal M. & S. Co. amount to about 10,000 tons per month. That company's Standard and Mammoth mills at Wallace handle about 27,000 tons of ore per month, its Morning mill at Mullan about the same tonnage, and its mill at Wardner handles from 12,000 to 13,000 tons per month. At the Morning mine the entire output is conveyed to the mill and shipping bins through a two-mile tunnel, which is on a level with the mill. There is a vertical distance of 1,000 ft. above this adit-level to the highest workings. A level has been run from each 200-ft. station.—Shipments of lead-silver ore and concentrate from the entire Coeur d'Alene district are estimated at 25,000 tons per month.—The Gold Hunter mine, situated near Mullan, has prospects of an increased production at one-third less in cost of mining and delivery at the mill. The lower cross-cut, which is on a level with the crusher-floor of the mill, was completed some time ago. It is 4,400 ft. long and intersects the orebody at a point 500 ft. below the old workings and 1,400 ft. below the apex of the lode. At the point intersected by the lower cross-cut, the lode measures 110-ft. from wall to wall. Within this lode are two orebodies—one next to the hanging wall and the other on the foot-wall. The two portions aggregate 50 ft. wide of solid ore. The narrow zone between the two highly mineralized bodies is also mineralized, but is low-grade. J. H. Gearon, superintendent of the property, states that the ore opened by this lower cross-cut will average 10% lead and 10 oz. silver per ton; and that heavy streaks of shipping ore will run 40% lead and 45 oz. silver. They have cut a station at this level and they are getting ready to rise on the orebody to the old workings. Within the next week or two all ore will be taken out through the lower cross-cut and the aerial tramway, which for several years has conveyed ore from the upper workings to the mill, will be discarded. As soon as preparations are completed the ore will be extracted through this lower level and production be increased to 300 tons per day, which will be milled. Facilities for sorting out the high-grade stuff are being put in and such ore will be shipped crude. Plans are in hand for installing a new

crusher in the mill and early next year the new cross-cut will be equipped for electric haulage.

Mullan, Oct. 11.

(Special Correspondence).—The principal feature of the mining industry in this district during the past week has been a cut of \$60,000 in the monthly dividend of the Bunker Hill & Sullivan mining company. For many months the company has maintained a regular dividend of \$181,000, but the dividend just declared for the month of September has been reduced to \$120,000. The decrease is directly due to the reduction of a cent and a quarter per pound in the price of lead. No reduction has been made either in the force of men engaged or in the output of the mine. The total dividends now declared by this company have reached \$9,786,000 of which \$1,740,000 has been declared this year. The decline in the price of lead has had a dispiriting influence in the Cœur d'Alene, but up to the present time the working forces at all the big mines remain the same as before. Some important strikes have been made during the week. The Vienna-International mine has cross-cut 16 ft. of the vein on the new level, recently started from the bottom of the winze, without reaching the foot-wall as yet; the ore exposed assays a little over 20% in lead and carries some silver and gold. Another big strike of antimony ore has been made in the Stanley mine and this, consisting of eight feet of clean ore, is the most important yet made in the property. At the bottom of the winze, which was sunk from the upper workings, from five to six feet of ore has already been exposed and the latest strike, made in a raise, has proved a stoping distance of 178 ft. The Stanley mine expects to make continuous shipments of antimony before the close of the present month. Work on the new compressor at Wardner for the Federal Mining & Smelting Co. is being rushed so as to have it installed before bad weather arrives. When this is installed the air-supply for the mines will be doubled; the new compressor will have 30-drill capacity. M. R. Rutherford, Ed. Donlan, J. L. Humble, G. F. Peterson, D. E. Peppard, W. H. Sedman, E. A. Winstanley, and C. E. Johnson, of Missoula, have made the first payment of \$12,000 on the three groups of claims near Murray, which they have had under option for the past nine months. The total price to be paid is \$105,000. The property consists of seven claims divided into the Keystone and Banner group, the Orofino group, and the Great Western group. Considerable work has been done under the direction of Mr. Rutherford and the showing is very promising. Up to this time all the work on these claims has been done by hand, but power from the plant at Thompson Falls will soon be supplied to the district. The Nabob, one of the most promising mines in the district and from which some lead ore has already been shipped, has closed down temporarily. It is understood that Harvey Ross, L. W. Gay, and George Stone, the principal owners, are negotiating the sale of it to the Panhandle smelter, in which F. Augustus Heinze is reported to have purchased a large interest. The ore, which has been shipped from the Nabob, carried 80% lead.—A cave occurred last week in the Hercules mine at Burke, in which two miners, Vincent Passadi and Larry Kiselico, were killed. The men were engaged in clearing away an old stope in the No. 2 level when the cave took place. For three days a force of from 50 to 75 men were engaged in digging for the bodies. A coroner's jury returned a verdict of unavoidable accident.

Wallace, Oct. 9.

NEVADA.

ESMERALDA COUNTY.

Two years ago 'Reub' Ryder took \$10,000 out of the Velvet claim; since then lessees have spent many thousands of dollars trying to find ore in the claim, but this pocket, from which the richest ore ever found at Goldfield came, appeared to be all the ore on the claim. But the Original Velvet lease finally discovered ore and last week shipped some high-grade ore. The ore was found on the 100-ft. level about 30 ft. from the shaft; the vein, which is two feet wide, runs east and west and dips to the south. A raise is being put up in the ore and cross-cutting has begun on the 250-ft. in the attempt to catch the ore there.—The output of

Goldfield for last week was 3,877½ tons of an estimated value of \$382,000. This is about 100 tons more than last week, but owing to the strike on the railroad the output was greatly curtailed. This especially affected the Mohawk, as it shipped only about half the usual tonnage. Last week the Mohawk Combination lease was closed down for several days. The Combination mill treated 540 tons in the six days that it ran. The shipments for the week were as follows: Jumbo dump, 385 tons; Mohawk Jumbo, 1,393 tons; Little Florence, 242 tons; Florence L. & M. Co., 97 tons; Hayes & Monnette dump, 30 tons; Mohawk mine, 500 tons; Red Top, 134 tons; Begole lease, 220 tons; Combination Fraction mine, 50 tons; Mohawk Combination, 280 tons; Original Velvet, 6½ tons. Total, 3,337½ tons.—The Begole is a sub-lease on the old Kalfus lease on Mohawk ground. This is its first shipment. The Mohawk Jumbo lease, which is producing the largest tonnage in the camp, is also doing the deepest mining. The ore comes from the 400 and 500-ft. levels. On the 500-ft. level of the Mohawk Jumbo, the deepest stoping in Goldfield, the ore is fully as good in grade as that above. Two other mines are down 500 ft., but comparatively little work has been done at those mines at that depth.—The two-compartment shaft on the Little Florence is 420 ft. deep and will be sunk to 575 ft. Four shifts are working in the shaft and record time is being made.—The strike on the Tonopah & Goldfield railroad has been settled and by now conditions have become normal.

LYON COUNTY.

The Union Blue mine, at Yerington, which is being worked under bond by F. D. Goodale of Denver, has just shipped a carload of high-grade copper ore. This mine is about 1½ miles north of the Ludwig shaft of the Nevada-Douglas.—The Wabuska Copper Co. is sinking a winze on the rich vein that was found two weeks ago. The winze is all in ore.—The Yerington Copper Co. has started to sink its shaft, which is 250 ft. deep, another 50 ft.—The Vladivostok group of claims has been bonded to Denver people. This group adjoins the Ludwig mine on the south.—There are no labor troubles at Yerington. The miners' union has decided not to ask for a raise in wages from \$3.50 to \$4.

NYE COUNTY.

At Manhattan the Mineral Hill shaft is 170 ft. deep; no water has been reached yet. It will be continued to water-level, where a station will be cut and cross-cutting begun. Stopping has commenced on the 65-ft. level of the Granny mine on Litigation hill. Considerable dry-washing is being done at Manhattan. The dry-washing machines on the Indian Camp and the Union No. 9 are making good clean-ups.—At Rhyolite the Shoshone mill is working quite satisfactorily. The three-compartment is being sunk deeper. At the Denver claim of the Tramp Consolidated a shaft from the 200-ft. level is being sunk. It is intended to sink this to a depth of 200 ft. in order to reach the original ore below the water-level. Rich shipping ore has been found in one of the leases on the Gibraltar property.

WHITE PINE COUNTY.

The ore line of the Nevada Northern, which will carry the ore from the mines at Copper Flat to the smelter at McGill is completed. Steam shovels are stripping the veins at Copper Flat. A four-compartment shaft 8 by 25 ft. in size has been started at the Veteran mine. This is to be the main shaft at the Veteran; raising has commenced from the levels below so as to hasten its completion. The large electric-driven hoist, built by the Denver Engineering Works for the Nevada Con., has been completed and is ready for shipment. This hoist will be installed at the Ruth shaft; it is the largest electric hoist ever built in the United States, being a 1,000-hp. hoist capable of raising 8 tons at a speed of 1,500 ft. per minute.

NEW MEXICO.

GRANT COUNTY.

(Special Correspondence).—The Forest Queen Copper Co. is developing 16 claims in the Silver City district. Several veins have been encountered, varying in width, and carrying sulphide ore that assays in zinc, copper, and silver. The

company is preparing to install steam hoists, a compressor, and other machinery. It has about 5,000 tons of ore on the dump. In one of the claims a vein of ore was struck which gave smelter returns of 7% copper.—The Exploration syndicate recently made a strike of copper ore in one of the shafts of their Copper Fiat mine, in the Silver City district. The ore was struck at a depth of 200 ft.—The Eighty-five Mining Co. is doing a large amount of development work on its mine in the Virginia district. The ore runs about \$40 per ton in gold, silver, and copper. Two shifts are working.—The Emma copper mine, situated in the Fierro district, and operated by C. P. Cramer under lease, is a regular producer. A body of high-grade ore was recently uncovered.—A deposit of copper ore has been exposed in the Continental mine, owned by John Brockman and associates, and situated in the Fierro district.—Large ore deposits have been uncovered in the Philadelphia mine, situated in the Hanover district, the development work being done under the direction of B. F. Baker. The ore runs from 10 to 18% copper.

Silver City, Oct. 10.

OREGON.

BAKER COUNTY.

(Special Correspondence).—The mills at the United Eikhorn mines are again running, and a large tonnage of rich ore is being extracted from the mines; 40 men are employed. Edward I. Field is manager.—The tunnel at the Eagle Mtn. copper claims on Goose creek is being driven day and night.—The Sparta Co. is developing a promising group of 15 claims near Sparta. The ore carries gold and silver. Frank J. Habelt is directing operations.—The Oregon-Idaho Investment Co. is actively developing the Iron Mask group. The 120-ft. cross-cut is in ore said to run 6% copper, besides some gold and silver. James A. Howard is superintendent.—At the Poorman group a promising vein of copper ore is being developed. The cross-cut has opened a vein of ore 130 ft. wide.—Good ore has been struck in the Indiana mine. The vein is 7 ft. wide and is fairly rich in copper. Another 15-ft. lode of copper ore is also being developed. The ore carries some gold and silver, and the mine is being vigorously developed.—An Eastern company has purchased a number of claims near Paddy creek.—The copper belt east of this city is attracting attention, and several rich strikes have been made. Eastern people have secured some of the best claims and are actively developing them.—Grading is about to commence on a new railroad from Baker City to the copper belt. Local people subscribed \$100,000 toward the work.—Another road is being constructed from Union to tap the west end of the copper belt.

Baker City, Oct. 10.

WASHINGTON.

STEVENS COUNTY.

(Special Correspondence).—The Spokane Lead Co. is erecting a 50-ton concentrator in the Metaline district, which is situated on the Pend d'Oreille river, 60 miles north of Newport, Washington. G. A. King, formerly mill superintendent at the St. Eugene mine, Moyie, B. C., is in charge of the construction. The ore of the district, which occurs as deposits in the lime and at the contact of lime and slate, is a galena, not accompanied by silver. The milling grade runs about 10% lead and the plan is to concentrate three tons into one ton. It is stated that about 10% of the ore is of shipping grade, some of it running 80% lead. The ore outcrops, so that it is planned to mine some of it in open-cuts. An adit is being driven, however, to explore the deposit at a depth of 300 ft. A tramway, 1,800 ft. long, is being built. Three other properties are being developed near Metaline.

Spokane, Oct. 11.

WHATCOM COUNTY.

It is reported that the deal between A. A. Haug and the First Chance Mining Co. has been declared off, as the former did not live up to his agreement to start work at the mine by Aug. 1; so the construction of a smelter in the Mt. Baker mining district is in the air.—The Bonita and

Granite Creek mining companies have made good clean-ups during the year.—A 15-stamp mill is being erected at the North American mine, and the Minnesota is putting up a 10-stamp mill.

BRITISH COLUMBIA.

BOUNDARY DISTRICT.

Last week for the first time the ore from the Granby mines was hauled over the new Victoria Shaft spur of the Great Northern railroad. The ore output of the Granby Consolidated for the last week was the largest in the history of the company, being over 23,000 tons. In one day over 4,000 tons were shipped from the company's mines. In all, 41,000 tons were shipped from the camp during last week. Also another record.—Work has commenced on the steel flue-dust chamber at the Granby smelter. Three hundred tons of steel will be required in its construction.—The large blast-furnace of the Dominion Copper Co. reduced over 700 tons of ore per day during last week and is running quite satisfactorily.—The following interesting facts are taken from the Granby Con. Mining, Smelting & Power Co., Ltd. treasurer's report for year ending June 30, 1907: Produced 16,410,576 lb. copper, sold at average price \$0.222; 257,378 oz. silver, sold at \$0.679; 35,083 oz. gold, sold at \$20; total amount realized, \$4,521,549. Working expenses at mines and smelter, freight, refining, selling, and general expenses, \$2,442,456; outside ores purchased, \$154,156; total expenditure, \$2,596,611. Cost per ton ore, including all expenses, \$3.697; net cost per pound copper, after deducting gold and silver values, \$0.1014. Net profit for year ending June 30, 1907, \$1,924,937. Expended in new construction and equipment at smelter and mines, \$317,678; for additional mining properties, \$68,164. Mine development, 9,701 ft.; diamond-drill development, 7,279 ft. Granby ore smelted, 649,022 dry tons; outside ore smelted, 16,893 dry tons.

Development work will be continued all winter at the Maple Leaf, Franklin Camp. The Golden Eagle mine on the north fork of Kettle river is getting ready a shipment of ore to be sent to the Granby smelter. This will be the first ore to be sent out over the new railroad, which has been built up the north fork. Twelve men are at work at the Golden Eagle. The electric-driven air-compressor has been installed at the Crescent mine and work will be resumed immediately.

EAST KOOTENAY DISTRICT.

According to the annual report of the Sullivan Group Mining Co. for the year ending August 31, 1907, the operating profit was \$77,092. The bullion account, due the company, amounts to \$472,091, while the outstanding bonds amount to \$400,000. The net profit for the year after deducting the amount of all interest is \$45,442. During the year the company purchased the Big Dipper and the Euphemia Fraction mineral claims and at present holds an option on the Commonwealth. The smelter manager recommends that the capacity of the smelter be increased from 100 to 200 tons at a cost of \$65,000 to \$75,000, but owing to insufficient development below the 100-ft. level, the mine manager opposes this policy and recommends that the shaft be deepened and another level opened at 200 ft. It is stated that enough ore is in sight to keep the smelter going at its present capacity for 10 months or a year.

MEXICO.

JALISCO.

The Quien Sabe M. Co., organized to take over the mines near Ajijic, on the north shore of Lake Chapala, will cyanide its ore direct. The company has erected a 10-stamp mill, with the idea of concentrating. C. H. Maris is treasurer, and Walter Wheeler is manager.—Several railroad men have bought silver-lead-zinc properties near Platinar station, on the Manzanillo branch of the Mexican Central. James Martin will be in charge.

SONORA.

One thousand men have been laid off by the Greene-Cananea Co. at Cananea.

The property of the Sonora-Bonanza Co. at Magdalena, has been sold to the Superior-Bonanza Mining Co. of Calumet, Michigan.

Special Correspondence.

Salt Lake, Utah.

Views of Mr. Guggenheim.—Tintic Dividends.—New Smelting Company.—Strike at Park City.—Oil Discoveries.—Ore Shipments.

Daniel Guggenheim, president of the American Smelting & Refining Co., and several members of the executive committee of that corporation, visited Salt Lake this week. In an interview, Mr. Guggenheim made the significant declaration that his company expects to go right ahead with improvements in this State. "We have already invested a great deal of money in Utah and it is the intention of the American Smelting & Refining Co. to invest more. For instance, we expect to increase the usefulness of the copper smelter at Garfield. Its present capacity is between 2,000 and 3,000 tons of ore daily, and it is to be enlarged to give treatment to between 5,000 and 6,000 tons of ore per day." Mr. Guggenheim expressed the opinion that the present crisis in the metal markets will soon be passed, and, when the tightness of money eases up, there will be just as great a demand for copper as ever before. "I believe," said he, "that we ought to see a great change in the condition of things within the next sixty or ninety days. The trouble is we have had too much business in this country for the amount of money to do it with. There should be an improvement when the money required to move the crops is out of the way."

Referring to the Sherman anti-trust law, Mr. Guggenheim declared that it should be repealed. "The business of this country cannot live under this law," he said, "but we should have a law like that of Germany which permits the manufacturers to get together and agree along business lines, and, in a legitimate way, not to overflow the market with any commodity. Under existing conditions in this country, two or three miners might get into trouble for agreeing to close their mines to prevent just such conditions as confront the mining industry of the United States. The law might be successfully enforced against the copper producers for agreeing to a certain output. Why should not the producers get together and agree along lines of public policy to not flood the market with their wares?" Without entering a prediction as to the immediate future of lead, he nevertheless believed it to be the best interests of the producer to curtail production for the time being.

Six Tintic mining companies have posted dividends this month. The contributing mines and amounts being: Colorado, \$60,000; Beck Tunnel, \$20,000; Uncle Sam, \$15,000; May Day, \$12,000; Grand Central, \$12,500; Mammoth, \$20,000, the last returning to the dividend list after a year's absence. Owing to a curtailment of 50% in the output of the Colorado and Beck Tunnel mines, the total dividends were reduced. Construction work on the new plant of the Tintic Smelting Co., is being pushed rapidly and the management is counting on placing it in commission about January 1. It will treat 400 tons of lead ore daily, which is to come principally from the Colorado, Beck Tunnel, and Grand Central mines. Practically all the equipment and material for the 10-mile railroad, which is to connect the principal mines of Tintic with the smelter, has arrived. Track-laying began this week.—The ore shipments from the Tintic mining district last week amounted to 145 carloads, the contributing mines and amounts being: Ajax, 2; Bullock, 1; Beck Tunnel, 7; Bullion Beck, 5; Carisa, 3; Colorado, 9; Centennial Eureka, 54; Eagle & Blue Bell, 6; Eureka Hill, 2; Grand Central, 7; Gemini, 5; Lower Mammoth, 10; May Day, 7; Mammoth, 9;

Seranton, 3; Tintic Iron, 1; Uncle Sam, 4; Yankee Con., 4 carloads.

There is no prospect of a settlement of the strike of miners which resulted in the closing of the Daly West, Ontario, and Daly mines at Park City. Pending the depression in the metal market, no eagerness is being displayed to adjust matters. The miners' union, as an organization, demands recognition, and this the mine management refuses to do.—Active development has commenced again at the Uintah-Treasure Hill mine at Park City. The property is being worked through the Creole shaft. It is expected that ore shipments will be made before the end of the year.

The shutting down of so many mines in Montana and the curtailment that has been manifest in Utah camps has bettered the fuel shortage complained of recently. The smelting companies are now receiving coal for storage, while the domestic demand is being well supplied.—In accordance with the policy adopted at the Boston Consolidated mine at Bingham, which is operated under his direction, Samuel Newhouse has ordered a reduction on the output of the Cactus mine of the Newhouse corporation in Beaver county. About 300 men have been let out and the mill is to be run on one shift only, the ore to be treated coming from places where development is in progress.—The Ophir Hill Mining Co., of which W. A. Clark, of Montana, is the owner, has won an important apex suit; this will mean a heavier production from the property of that corporation at Ophir. Thomas F. Keely, of Chicago, and others, owners of the Montana mine, attempted to get extra-lateral rights with judgment for \$1,800,000, the value of the ore extracted.

The annual meeting of the Bingham New Haven Mining Co. resulted in the election of Louis E. Stoddard, president; T. W. Farnam, secretary and treasurer; who, with Fred F. Brewster and E. G. Stoddard, of New Haven, Conn., are directors. C. H. Doolittle, of Salt Lake, will continue as manager. This company owns the Bingham-New Haven mine, one of the principal producers of Bingham.—Great interest is being manifested in the oil discoveries made a few months ago in the Virgin district of southern Utah, and there is every reason to believe that the field is going to prove to be an important one. Salt Lake, Goldfield, and Los Angeles capital has become extensively interested there.

Joplin, Missouri.

A Better Zinc Market.—Figures of Production.—New Stock Exchange.

—The Mining Congress.—Promising Finds of Ore.

The highest price reported paid for zinc ore last week was \$44 per ton and the assay base price ranged from \$38 to \$42 per ton of 60% zinc. Considerable more ore was sold above the \$40 mark than for several weeks, indicating a much stronger market. Lead ore sold at \$55 per ton at the best and that market was generally stronger, but there is little hope that this metal will advance very soon. Figuring the average output for the past eight months to the end of August at 25,732 tons per month and the September output at 17,840 tons, there is a decrease of 7,892 tons; add to this a decrease in the stock in the bins of 1,390 tons during the month of September, gives a total decrease of 9,282 tons. This is a conservative estimate of the total decrease due to the shut-down in September, but the producers responsible figure the restriction at 16,000 tons. The mistake they make is by taking the capacity of the mills included in the shut-down, instead of the actual production that each mill has made during the eight months of this year.

The shipment last week was the smallest of the year, amounting to: Zinc ore 8,369,600 lb., valued at \$159,321;

lead ore 1,370,230, valued at \$35,578; combined value, \$194,899. The shipment for the month of September was by far the smallest of the year, amounting to: Zinc ore 38,369,120 lb., valued at \$770,050; lead ore 4,468,870 lb., valued at \$122,217; combined value, \$892,267. The shipment for the 40 weeks of this year is: Zinc ore 459,082,270 lb., valued at \$10,471,257; lead ore 69,685,510 lb., valued at \$2,574,755; combined value, \$13,046,012. This shows an increase over the same period of last year of 35,155,550 lb. zinc ore and 8,777,400 lb. lead ore, and, in value, \$1,573,257.

At a meeting of the members of the proposed Joplin Stock Exchange held at the Joplin Commercial Club rooms recently, it was recommended that James F. Gallagher, of Boston, be made manager of the Exchange and his election is assured at the first directors' meeting to be held in the near future. It was decided to increase the membership from 100 to 200 and a committee was appointed to secure the extra 100 members. Clay Gregory was made provisional treasurer and was authorized to make a call for the first membership fee of \$25. Attorney F. W. Kelsey was selected to draw up the by-laws and

Luke land, west of Joplin on the Seventh St. road, is one of the new producers in the Joplin field. They made a turn-in last week of 36,000 lb. lead. They have a new modern 300-ton concentrating plant and the property is located in the new sheet ground district that promises to do much for Joplin and this end of the district.

Leadville, Colorado.

Monthly Output.—French Mountain Co.—The Iron Mask.—Resumption at the Greenback.—Shaft-sinking on the Roy Claims.—Electric Transmission.

The month of September closed with a total production for the district of 77,000 tons. Of this amount the local smelter received 60,000 tons.

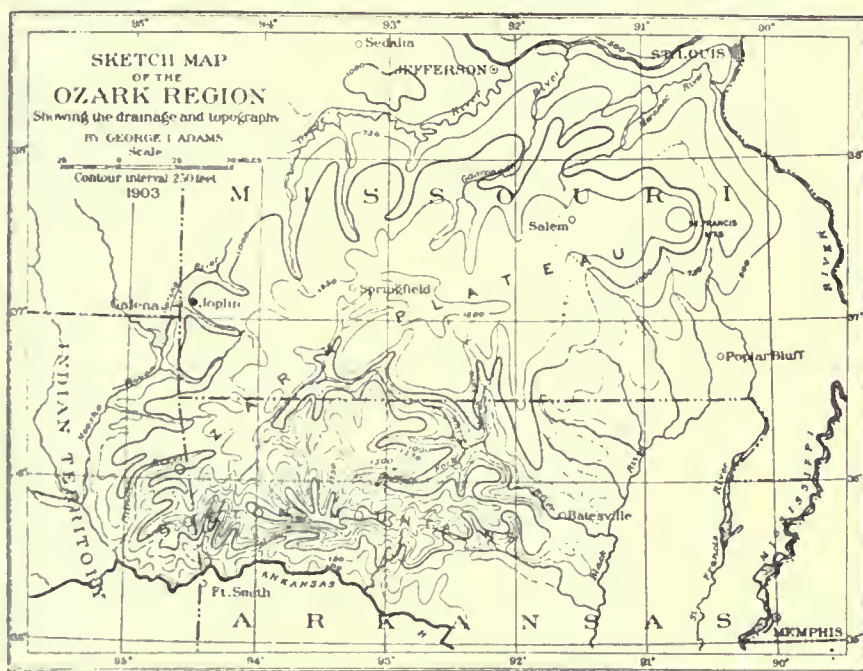
J. W. Bailey, of the French Mountain Co., states that a hydro-electric plant will be installed at his property on the mountain of the Holy Cross; it will have sufficient capacity to operate the new 120-ton cyanide plant and power for drills to push development work. The new cyanide mill went into service during the early part of the summer, but was unsuccessful on the unoxidized ore although

a good saving was reported on the surface ore. It is now intended to add a roasting plant to treat the refractory material. Some years ago an adit was driven over 600 ft. on the Grand Trunk vein, and at a point 660 ft. lower a second adit, which is now in 2,600 ft., has also cut the big vein. The vein is reported very strong at both levels, exposing a good shoot of \$30 milling ore.—The Old Iron Mask property will soon resume operations under the management of S. N. Hicks, with C. H. Harrington, of Denver, as superintendent. This property is situated in the Gilman district and has rivaled the Robinson, situated on the opposite side of Robinson mountain, in the production of lead and silver. A tonnage variously estimated from 500,000 to 1,000,000 tons is now developed and ready to stoep. The orebody is one of these complex

zinc and iron deposits for which the district is noted, carrying from 8 to 10 oz. silver, 18 to 30% zinc, 10% lead, and a small quantity of gold. The ores predominating in zinc will be treated at Leadville and the heavy iron ores will go to Pueblo.

The Greenback mine on the east slope of Carbonate hill is rapidly being put into shape for production and the shaft repairs will be complete in a very short time. A large station is being cut preparatory to the installation of a new station pump at the 900-ft. level. Large bodies of iron and zinc ores are known to be available, in fact, this property bears the reputation among local mining men of possessing the most important body of zinc ore of any property of equal area in the district. Some years ago a disagreement arose between the producers and the smelter management regarding treatment charges on the iron ores and as a result the mine was closed down indefinitely. The boiler plant, which consists of a battery of six 80-hp. boilers, is completed and the large first-motion hoist has been repaired ready for operation. A. M. Emulaw, of Salt Lake City, will manage the property and shipments will be commenced about November 1.

The showing made at the Mammoth, in Big Evans gulch, indicates that a large body of ore trends through



Map Showing Position of the Joplin District.

constitution.—The Arkansas mining district is making big preparations for the meeting of the American Mining Congress, which meets at Joplin on November 11. A whole carload of zinc specimens will be exhibited by the operators from that district and they will have an abundance of literature to advertise their mines.

Workmen have begun sinking a shaft on the George Koontz farm, a short distance northeast of Carthage, and are confident of finding ore, although no prospecting had been done with a drill, as is nearly always the case now before starting a shaft.—Kansas City parties have purchased the LeGrand Mining Co.'s lease of 35 lots on the Granby Mining & Smelting Co.'s land north of Chitwood. A mill is already built on the property and the new owners are remodeling this and making preparations for working the ground on which the mill stands. Some excellent strikes of both lead and zinc have been made on some of these lots.—The Good Day mine at Alba is a new producer that entered the list last week, turning in 108,000 lb. zinc ore. The mine is on the E. Aylor land north of Alba and gives promise of being a big producer. A modern 200-ton concentrating plant has just been completed.—The Cambria mine on the

the gulch toward the northeast. This belief has induced Thos. F. Walsh to make preparations to sink a shaft on the Roy group of claims, which side-lines the Mammoth tract. The manager, J. W. Benson, states that work on the new shaft will be commenced about Oct. 15 and will be sunk 600 ft. for the first lift. The Roy is situated to the northeast of the Mammoth and on the hillside, and the proposed shaft will be fully a mile from any producing property.—The discovery of a shoot of ore from six to twelve inches thick in a fissure vein on the Minneapolis claim has created considerable interest. The ore is silicious and of a shipping grade, but it is yet too early to estimate the importance of the discovery.—Attention was formerly called by your correspondent to the discovery of the old Robinson shoot in the shaft of the International Mining Co., but later developments have convinced H. M. Shepherd, the manager, that the shoot

development while fuel is so expensive.—Frank Soder and Joseph Michlich, who have a lease on the Eclipse claim in Empire gulch, are shipping considerable ore. The ore runs better than \$30 per ton, principally silver. Transportation has been a serious handicap and will continue so until the Denver & Rio Grande railroad lays a switch into that part of the district.

Mexico.

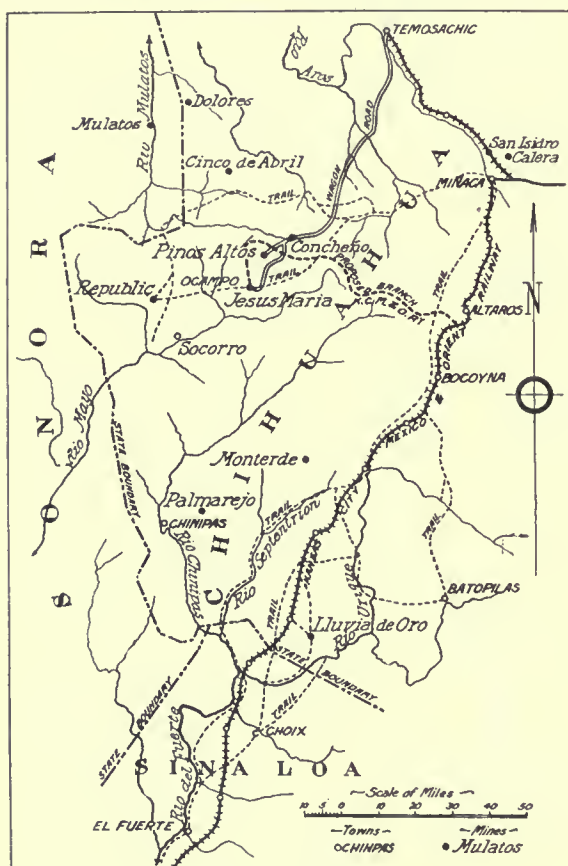
Rio de La Plata Co.—Litigation Over Ore.—Rapid Mill Construction.—Local Smelting of Stolen Ore.

The Rio de Plata Co. is successfully operating its 25 stamps and pans. The ore is rich, and the tailing is consequently high; this is being stored for re-treatment in a cyanide plant, a contract for which has been let. Considerable litigation is resulting from the discovery of more and better ore than the former owner supposed existed. The geological formation is said to be an "andesitic intrusion in Tertiary tufa." The country is much broken and the ore easily lost. Several good finds have been made lately on open ground in this neighborhood. The mill and residences are in the bottom of a narrow gorge over 2,000 ft. deep, which is supposed to have been a fissure originally. These gorges are the predominating feature of western Chihuahua, and are the cause of 15 to 20 horizontal miles being a day's journey.

The mill at the Guerra al Tirano mine started on Sept. 26, and has run continuously since. The ore is high-grade in gold, and the sorted ore from development work has paid for the mill and its transportation. On account of the desire of the manager, Frank Holmes, to have the mill running at the earliest possible moment, most of the iron work was sent from the States to the terminus of the railroad *by express*. From the railroad to the mine the mill was transported on mules for 12 days. The mill has been built in less than four months from the start. The ore is hard quartz, which is crushed through breakers to $1\frac{1}{2}$ in., then through rolls to $\frac{1}{4}$ in., and thence through batteries of 850-lb. stamps. On account of the hardness of the ore, this size feed is possible, and the capacity of the mill will be proportionately larger. Sand will be leached and the slime agitated, and then treated in a Butters filter.—The Palmarejo Mexican Co. is also under Mr. Holmes' management since the resignation of Mr. Pomeroy. Mr. Pomeroy had purchased a Butters slime-filter to supplement the weak point of their slime-treatment plant, and Mr. Holmes is pushing the construction of this addition. All slime has been impounded instead of being discharged into the river, and will be brought back to the filter for washing. The company is considering the expenditure of £60,000 for a power plant at the river and a large mill at the mine, in order to treat the low-grade ore that has been developed during the last hundred years, and which will not bear the cost of transportation and treatment at the Zapote 60-stamp mill.

Several *vasos* are now working continuously on ore, amalgam, concentrate, and cyanide precipitate, at Guazapares. One storekeeper purchased over P3,000 of gold and silver bullion at this place in one month. These products are supposed to come from the various mines in the neighborhood, though none of the companies sell their product locally.—A number of groups of mines have been bonded in the vicinity of Chinipas, and several good prospects are being developed.

The Cia. Metalurgica y Refinadora del Pacifico, which is building a smelter at Fundicion, Sonora, on the railroad, expects to blow in the early part of December, and will be in the market for the purchase of custom ores after November 1. W. D. Schellinger, superintendent



Map of Part of Mexico.

cut at the 1,120-ft. point was an entirely new body and totally unexpected. This new shoot is 12 ft. thick at the point cut. About 7 ft. consists of lead-zinc ore running 20% lead, 28 to 35% zinc, and 20 to 30 oz. silver. The lower 4 ft. is principally fine-grained galena with 30 oz. silver per ton. The sinking was resumed and at an additional depth of 80 ft. the Robinson shoot was cut, but no information is available at this date as to its extent and value.

An electric transmission line has been completed to the Ready Cash property and a branch line to the Long and Derry. Both properties are installing electric machinery to carry on their operation in the future. With the advent of cheap electric power, the old project of driving an adit into Prospect mountain has been revived. The promoters assert that an adit can be driven to cut every formation common to the district since the entire series of sedimentaries is tilted at a high angle in the section where the adit is proposed to be driven. Among the various contacts exposed, low-grade bodies of ore have been found, but of a grade too low to stand

for the San Javier Copper Co. of Chicago, Ill., is opening a new copper property in the vicinity of Batacosa, some 30 miles from Fundicion station. They are now down 60 ft. and report the prospect as very encouraging.

Johannesburg, Transvaal.

Tin Mining.—The Government to Operate a Mine.—Crime Among the Chinese.—Repatriation of Coolies.—August Output.—A Record.—Sorting of Waste.

One of the most unfortunate mining episodes since the war was what is known as the 'Sally' calamity. On property owned by the South African Lands (Sally's) tin was found, and on the strength of several reports, the shares were boomed sky high. When crushing operations commenced, it was found that the tin mine was a fiasco. Shares came down with a bump, and many people were ruined. It was thought that this episode would prove the quietus of tin in the Transvaal for some years to come. But tin is very much in evidence again. For some months past several parties have been working away on some tin prospects in an area north of Pretoria. No fortunes have been made, but the companies and individuals at work have made good profits by shipping their concentrate to Europe. When the Government announced that the area would be thrown open to public pegging on a certain day, there was a considerable preparation to get ready for the mad rush for claims. Some large firms had bodies of men ready to peg for them. At the last moment, to the surprise of every one, the Government withdrew the notice, and no claims were pegged by the public.

People now understand the Government's action in regard to the new tin fields, for it is now known that the Government intends to operate, in order to make work for the numerous unemployed white men now on the Rand. It is a bold scheme to run a Government mine. Unless it is managed better than some of the enterprises the Governments have run in this country, it will require solid tin to make it pay. The intentions of the Government are highly commendable. The local press applauds this practical demonstration on the part of the Government to relieve the distress now so prevalent on the Rand, but many fear that the enterprise will be mismanaged and that the burden of the experiment will fall on the hard-pressed tax-payer. It is proposed to send up a few experienced hands at first to do some prospecting, and others of the ex-strikers and other unemployed to follow later. If the new venture can even be made to pay expenses, then it is worth while, for employment will be found for some hundreds of white men who otherwise would have left the country. The full scheme of working the tin has not yet been worked out, but it is satisfactory to note that no Kaffirs will be employed, the white men being required to do all the work. To some of the men on the Rand who for years have acted as supervisors at very high rates of pay, it will be quite a shock to descend to manual toil. No doubt there will be a lot of grumbling at first.

During the past few weeks there has been a recrudescence of Chinese crime along the Rand. As the time of their departure draws nigh some of the coolies find themselves without any money with which to meet their gambling and other debts. To the baser sort of Chinese the simplest method of getting money is to go out and steal it. Several houses on the East Rand have been attacked, some of the inmates having been wounded seriously. In one case the owner of the house was murdered by the coolies. The whole of the gang was captured a few days after the crime, and are now being tried for murder.

The fact that they will not be allowed to exercise their option and sign on again for three years has come as a surprise to many of the coolies, who have reckoned that they had a long time in which to pay off their debts. Now that they know that all coolies are to leave at the end of the first three years, the Chinese are getting somewhat out of hand and are causing some anxiety. Extra precautions are being taken to keep the crime down to a minimum. So far all coolies who have left have been replaced by Kaffirs. No difficulty is expected this year in procuring sufficient Kaffirs for the mines.

The returns for August have proved a pleasant surprise to most people, for once again a record output is established for the Transvaal; and in fact for the world. The production for the month of December last, the record output, has been exceeded by 4,860 oz. The total output for August was 555,027 oz., valued at £2,357,602. Of this total the Rand contributed 534,598 oz., valued at £2,270,826. The total number of stamps at work in the Transvaal was 8,665, which is an increase of 85. The output for August was swelled considerably by the extra 11,750 oz. declared by the Robinson mine. The gold reserve at this mine has grown so enormous that it was decided to get some of the gold off the reserve account. For this reason the August declaration from the Robinson was declared at 35,714 oz., valued at £151,703. On the whole the mines do not seem to be sorting as much as they did previous to the strike. Some properties show that over 35% has been thrown out as waste rock, while on others there is no sorting at all. The fact that less sorting is being done, and that the wage bill for white labor is much less, tends to reduce working costs materially. One of the largest corporations on the Rand succeeded in showing the lowest working costs on record last month, namely an average of 19s. 10d. per ton milled. Feverish efforts are being made to cheapen the expense of production on the Rand. Had the Chinese remained, a fine record in costs for the Rand would have been established.

Toronto, Canada.

Suppression of Wild-Cats.—Action by the Government.—Ore Shipments From Cobalt.—News From the Mines.

Steps are at last being taken by the Attorney General of Ontario to suppress wild-catting in connection with the mining industry. Lately a number of worse than doubtful Larder Lake propositions have been put on the market and extensively advertised to catch small investors, shares being offered at as low as 10c., or even in one instance 6c. This week the firm of Law & Co., Toronto, received a warning as to the illegality of the advertisements of the shares of the Highland Mary gold mines of Larder Lake, which were being put on the market at 10c. per share. This proved effective in inducing them to withdraw their announcements. The action of the authorities is due to the outspoken and courageous course of *The Canadian Mining Journal* in pointing out the delusive character of the inducements held out by these advertisements, and the failure of the wild-cat promoters to comply with the stringent requirements of the law as to the specific information, which they are required to furnish, including the cost of property, preliminary and promotion expenses, and the extent of the interest of the directors in the enterprise. These requirements have been systematically ignored. While the daily press has from time to time vigorously denounced wild-catting—in the abstract—they have always been ready to accept the most obviously fraudulent advertisements with accompanying reading matter notices at so much per inch, endorsing their extravagant claims. The existing law is

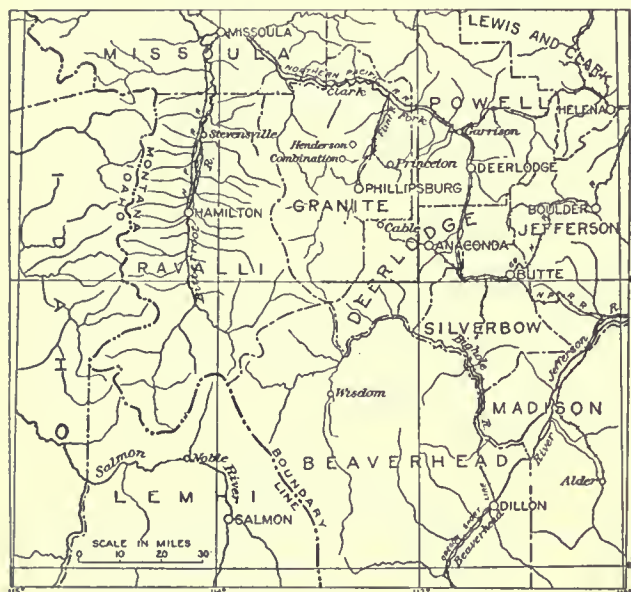
ample for the protection of the public, but so far no attempt has been made to enforce it. A prosecution of some of the worst offenders may follow.

Shipments of Cobalt ore for the week ending October 5 amounted to 250 tons, from the following mines: Buffalo, 40 tons; Coniagas, 32; McKinley-Darragh, 86; Silver Queen, 32; Tretheway, 59.—An important strike was made last week on the Silver Leaf property while the surface men were prospecting for stringers 450 ft. from the main shaft. The vein is of calcite, smaltite, and native silver, and from 18 to 24 in. wide, and was uncovered for about 12 feet.

Butte, Montana.

No Further Decrease in Production.—Lessees Stop Work.—General Retrenchment.—The Barnes-King Fiasco.—The Wage Scale and the Price of Copper.—Pittsburgh & Montana Smelter.

There has been no further curtailment of the copper production by the Butte companies in several weeks, and no further reduction in the working forces at the mines



Montana.

and smelters, except that at the Clark Reduction Works there has been some interference with operations on account of the trouble with striking machinists, who have prevented other employees making repairs on broken machinery. The October copper production of the Butte district will fall below 9,000,000 lb. Of that amount the Great Falls and Washoe smelters produce about 7,000,000. These two smelters treat the ore of all the Amalgamated mines, the North Butte, Butte Coalition, and some custom ore. The only other producers of importance now are the Clark mines, and they add less than 1,800,000 lb. to the total output. The Pittsburgh & Montana and La France companies have produced nothing in October, and the latter has not produced since August. Nearly all lessees on copper ore have been shut off, and those employed by the East Butte Co. are about the only ones still at work. Lessees on the upper levels of the East Butte continue to ship ore to Utah for treatment, and the company treasury receives a round sum in monthly royalties even at the present reduced price of copper. The product of the two precipitating plants of the East Butte Co. is taken to the Washoe smelter, which no longer buys ore. Two carloads of concentrate from the East Butte concentrator were shipped to Ogden a few days ago. The East Butte recently stopped all dead

work, and is curtailing expenses, in common with all other companies in this district. Large reserves will enable the East Butte to ship ore as soon as the copper market justifies it. Considerable work has been done on the rich orebody recently opened on the 900-ft. level. The ore is 62 ft. wide, and contains 4 ft. assaying 12% copper, the remainder of the vein being good second-class.

The lessees in the Ophir mine of the Butte Central & Boston Co. are shipping a lot of high-grade silver ore to the Washoe smelter. Several large bodies have recently been opened on the 500 and 300-ft. levels of the Ophir, and the royalties paid by lessees more than pay the company's expenses.

The more the investigation of the Barnes-King Development Co. fiasco proceeds the more apparent and convincing becomes the fact that it was a deliberate swindle on the part of some one, though it has been difficult to fix the responsibility. A. J. Campbell, the chief promoter of the affair, is dead, and John C. Lalor, his associate, went to Europe about the time of the exposure, so that statements from two men who knew all the facts are not available. But it is known that a worked-out property, purchased for probably \$800,000, was unloaded on the company for \$2,000,000, and that the company received for the treasury from the promoters only \$400,000. What became of the difference has not yet been ascertained. Evidently the Butte contingent, the heavy subscribers, were confiding victims. They believed absolutely in the representations made by Campbell and Lalor and the engineers who experted the property for them. The reports were enough to mislead any one, and how they were made, or induced, is one of the things that has been puzzling the victims. A remarkable thing about the whole fraud is that after the new company took possession of the property, and the promoters had their managers in charge, the same glowing and promising reports continued to come from the property, and even when John Gillie, the new president, was engaged in examining the property and discovered that there were but 25,000 tons of ore in the mine, bogus interviews were sent out from Lewistown, where the mines are situated, quoting Mr. Gillie as saying the property was all that was represented, and that dividends would soon be paid, when the fact was that the possibilities of dividends were remote, and Mr. Gillie had the very poorest opinion of the property. The investigation now being conducted by Mr. Gillie and the new board of directors may disclose the guilty persons, and may also account for the missing funds. H. C. Brown & Co., bankers and brokers of New York, principal underwriters for the Barnes-King, say they were induced to interest themselves in the Barnes-King by Campbell and Lalor, who presented the reports of reputable experts, and also reported that they had made personal examinations of the property.

The Butte Miners Union says it intends to abide by the contracts entered into with the different mining companies relative to the wage scale, regardless of the action of the Western Federation, which repudiated the contracts. In reply to a notice from the companies that for the present they would not enforce the terms of the contracts but would continue to pay the \$4 day scale until the status of the metal market was more defined, the union sent this letter to the mining companies: "Your communication of Sept. 30 regarding the scale of wages under the present conditions and the price of copper was received and read at our regular meeting of Tuesday, Oct. 2, and we desire to notify you of the acceptance of it and to extend the thanks of the union for your attitude in this matter. We hope that the amicable relations existing between the companies you represent and the

Butte Miners Union will exist for an indefinite period of time. We realize that the agreement entered into between your companies and this union is binding on both parties, and fully appreciate your position in the matter in our behalf."

The Pittsburgh & Montana Copper Co. has decided to rebuild its smelter and put it in shape to treat its own ore again. The smelter was erected by Ralph Baggaley about five years ago as an experimental plant for his new process, but it proved unsuccessful, and the plant was shut down after the experiments had cost the company more than a million dollars. In order to make it good for anything the smelter will have to be reconstructed. The company has several large orebodies blocked out on the 800 and 1,200-ft. levels, much of the ore being first-class, and at the time the Washoe smelter stopped taking the company's ore it was shipping 8 to 10 cars per day. It is proposed to give the smelter a capacity of about 200 tons per day.

Denver, Colorado.

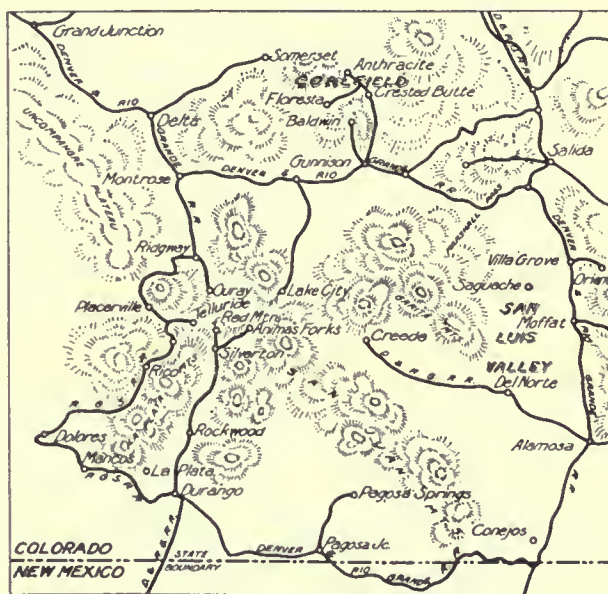
Smelter Rates.—Importation of Miners From Joplin.—The Stock Exchange at Colorado Springs.—Cyanide Plants at Cripple Creek.—Filter-Presses.

One of the most recent activities of the American Mining Congress is an inquiry into the relations existing between the ore producers and the smelting interests. An effort is to be made to ascertain the amount of truth there is in the often repeated charges that the smelters charge excessive rates for treatment and use their power to stifle all competition, their influence with the railroads as large shippers putting them in a commanding position. Where there is so much smoke there must be some fire, and doubtless when the investigation is finished it will be found that the charges against the smelters are partly true and partly untrue. That the charges imposed for smelting are high compared with smelting costs is undoubtedly true, but the producer and the smelter look at it in two different lights. The producer regards as a fair rate one that yields a reasonable profit over and above the cost of smelting. The smelters consider by what other means the producer might treat his ore, and at what cost, and then offer him a rate enough lower than that so that he will send his ore to them. In other words the principle is to "charge all the traffic will bear," which to Israelitish eyes is only sound business policy. Whether the Mining Congress can persuade them otherwise is more than doubtful. As to stifling competition, what influence the smelters have with the railroads and how they may wield it is hard for anyone not on the inside to know. But it is rarely necessary for the large centrally situated smelter to make any effort to stifle the small local plant, for the advantages are so enormously in favor of the former that the ambitious local smelter is generally overwhelmed after a brief existence, not to mention cheaper supplies, more favorable labor conditions, and the lowered costs incident to working on the larger scale; moreover, the control of a varied supply of ores to draw upon permits a more favorable smelting mixture, which immediately puts the plant dependent on a local supply (except in the few fortunate instances where the ore is self-fluxing) out of the running. Whatever the means to be taken to bring the American Smelting & Refining Co. into a more tractable mood, it is obviously not by the building of local smelters.

Last week 40 experienced miners from Joplin were brought to Silverton, and their arrival was the cause of much interest, as might naturally be expected in a camp that has been as shorthanded as Silverton this year. The men are all experienced machine-men, an additional

boon, for the harassed superintendent has frequently been obliged lately to give charge of machines to men whose claims as drillers were founded on a couple of shifts tending chuck. The constantly increasing influx of the foreign element into the Colorado labor situation cannot but be a source of uneasiness to the observer, for the foreign element is undoubtedly the trouble-breeder. The 'bear-dancers' and other foreigners come crowding into the smelting centres and thence into the mining towns, gradually displacing the native workman and unsettling labor conditions in a way that is far from reassuring.

There has been a movement on foot to abolish the Colorado Springs Mining Stock Exchange, but it has been finally decided to retain it for the present. Cripple Creek has long ceased to be a 'boom' camp, and the particular form of gambling that masquerades as trading in mining stocks no longer flourishes in its vicinity. Nevada man-



Map of Southwestern Colorado.

ages to supply a little stimulus for it, but the days of prosperity of this particular exchange are past, and no bona fide producer mourns the passing.

Cyanide plants spring up so rapidly in the Cripple Creek district that it is a little difficult to keep track of them all. Most of the recent mills are rather small ones of 100 to 150 tons daily capacity, and are planned to treat oxidized ore. Some of them are already working with conspicuous success. The real problem at Cripple Creek, however, is the treatment of the low-grade unoxidized ore, of which millions of tons are already on various dumps, and many millions more underground. This material is too low-grade to stand freight charges, so the mills must be built at the mines. On the other hand, the high labor cost and the price of coal make roasting at the mines prohibitive. The treatment of such ore by cyaniding now seems to be the only method of much promise. One feature that seems not yet to be fully appreciated is the necessity for fine grinding. It must be remembered that these ores, with their finely disseminated tellurides, present quite a different problem from pyritic ores, where the gold in thin leaves lies along the cleavage planes of the pyrite, where it is easily reached by the cyanide solution. There seems also to exist along with this a prejudice against the vacuum-slime filters, such as the Moore and Butters. Two companies are experimenting with quick-opening positive-pressure filters, the Kelly and Chamberlain presses being the ones chosen for this purpose. The experiments seem to have produced a favorable impression in both cases, but are not far enough advanced for definite conclusions.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

IN treating silver-bearing sulphides by the cyanide process, fine grinding is imperative in order to get a good extraction. Besides, the rapidity of solution increases in proportion to the fineness of grinding. This fine grinding is expensive, but if the grinding is not fine, the cyanide consumption is high. The cyanide man must find a happy medium between these two evils and thus obtain the best results consistent with low cost.

ALLUVIAL MINING contributes greatly to the gold output of Victoria, in Australia. In 1906 there were 125 dredges working, 5 idle, and 18 building. Thirty-six bucket-dredges raised 8,243,010 cu. yd. gravel yielding 1.8 grains per cubic yard. The average weekly output for such a dredge (about 900 cu. yd. daily capacity) is approximately 22.7 oz. at a cost of about \$280. The average yield of the ground worked by 82 pump hydraulic mines was 2.85 gr. per cu. yd., while the highest return from any plant was 3.4 gr. per cu. yd. At 12 hydraulic sluicing plants the average was 4.12 gr. per cu. yd. The total area worked by hydraulic methods was 586 acres of river-bed and valley land and 60 acres of pastoral land.

THE Adair process of cyaniding slime, which has been used with considerable success at the Crown Reef mine on the Rand, is a system of agitating slime in the presence of manganese oxide, thus hastening the solution of the gold. The agitator consists of a central hollow shaft fitted with radial arms on which are stirring blades inclined on alternate arms in and out, respectively. The ends of these arms are attached to a hoop of angle-iron forming a wheel; around this passes an endless rope by means of which the agitator is turned. The cyanide solution is fed down the hollow shaft and out through the radial arms into the agitator-vat. The top solution is siphoned off into the precipitating boxes.

THE calcined precipitate from the zinc-boxes, in which a gold-bearing sulphide ore is being treated, is very apt to contain a good percentage of ferric oxide. The following flux has been found to give good results when smelting such a precipitate: Precipitate, six parts by weight; borax, six parts; sand, one-half to one part; fluorspar, one-half part; litharge, one-half part; carbon, as required. In this flux a large amount of litharge is used to replace the customary sodium carbonate. The litharge and fluorspar give a more fluid slag; this fact and the larger amount of litharge reduced, by facilitating the collecting of the gold, yield a cleaner slag. If there is not sufficient iron in the precipitate to bring down enough lead to impoverish the slag, carbon or iron must be added.

THE method of stull-timbered ore-filled stopes, similar to that used at the Camp Bird and other American mines, was introduced at the Great Fingall and other Australian mines when Bewick, Moreing & Co. assumed charge of them. At first this method was not liked by the Australian miners, probably owing to the fact that they doubted the safety of it. But owing to the successful use of this method at the Great Fingall, it is now in better favor. Where stull-timber costs about \$1 per foot as it does at Perth, it is merely a question of time when such a scheme becomes imperative. Ore-filled stopes are im-

practicable where the dip is low, for the ore must run easily into the chutes when drawing commences. At the Fingall, where the dip averages 55°, this method works admirably. In Australia it is called the 'shrinkage' method.

IN ORDER that rust may be formed, iron, oxygen, and water must be in contact with each other. Iron will not rust in dry air nor will it rust in water unless oxygen is present. There are three theories which are advanced to explain rusting. According to the oldest and most commonly accepted, the carbonic-acid theory, it is assumed that the presence of carbonic or some other acid is necessary in addition to oxygen in order that rust may form. The second theory presupposes the formation of hydrogen peroxide in rusting; consequently the prevention of the formation of hydrogen peroxide would prevent the formation of rust. The latest theory is the electrolysis theory. According to this theory the rusting is due to electrolytic action between different portions of the same piece of iron or steel. This happens because of slight variations in composition of different portions of iron or steel articles. According to this theory the presence of oxygen in the water is necessary in order to oxidize the hydrogen released at the positive pole of the couple and so prevent polarization. Experiments by W. H. Walker, of the Massachusetts Institute of Technology, appear to confirm this theory.

A QUARTZ mill was built in California and water taken for use in connection with such mill from a spring on vacant public land by means of a combination open flume and pipe-line. The mill has been closed for three or four years, but the owner has kept the flume and pipe-line in repair and has continuously used the water for domestic purposes. What would be the relative rights of the mill-owner and those of one who should locate the land on which the spring is situated?

Assuming that the spring in question flows, giving rise to a watercourse, or which would give rise to a watercourse were it not for the diversion of the waters thereof by means of the flume and pipe-line, and that a proper appropriation of the water has been made, the right of the mill-owner to divert the water under the circumstances above detailed would take precedence over the rights of the subsequent purchaser of the land from the Government.

The right of an appropriator of water may be lost by abandonment or by forfeiture; by abandonment, where an intention to surrender such right is accompanied by overt acts clearly manifesting such intention; by forfeiture, where there is a failure to put the water to a beneficial use, a non-user extending over a period of five years. In the instance noted above, there was evidently no abandonment. The act of the mill-owner in keeping the flume and pipe-line in repair evidenced the intention to keep the right alive, while the mere closing of the mill and the consequent non-user of the water for that purpose in the absence of something showing an intention to abandon the mill would not be sufficient to constitute an abandonment of the water right.

It is quite clear also that the right has not been forfeited, since the non-user for milling purposes has not continued for five years. At the end of such period, however, the owner of the mill would lose his water right based on his appropriation for mill purposes. Yet the forfeiture would not extend to his entire right to take water. Having put a part of all of the water so diverted to a beneficial use for household purposes, he would still have the right to the use of such amount of water as he had used for household purposes.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

Professional Customs.

[In our issue of October 5 there appeared a series of questions put by a young mining engineer in quest of advice from the experienced members of the profession. We have received several replies, which are published herewith. Others will appear next week. For convenience of our readers, we reproduce the questions before giving the answers.—Editor.]

The Editor:

Sir—It often happens that young engineers are called upon to make an examination of mining properties before they have had any experience in work of this kind. Of course, there must be a first time for every engineer. Assuming that he is competent to make the examination and deliver the report, there are a good many minor questions regarding the etiquette of the transaction, the answers to which are not in the books; the only standard the young man has by which to gauge his procedure, is what the seasoned engineers can tell him, and the scattered and scanty information on this subject that is in print. Therefore, in behalf of the younger generation, I would like to ask the following questions, all of which are simple, many of which may seem unimportant, but most of which are of interest to the man who has had but little experience in examination work. If we could get answers to some of the questions from several men, we might deduce a series of useful rules. The objection will probably be raised that the questions are too ambiguous to be answered intelligently, as each individual case introduces diversified conditions. But it is impossible to arrange a more detailed set of questions in a compact form, so they must be treated in a general way. Assuming that the examination will consume from one to three months, and entails the necessity of a rather long journey on land and water, the man for instance starting from Colorado, bound for the tropics, and that the amount involved is about \$100,000, then;

1. Is it better to charge a fee, or undertake the work on a salary basis?

2. Is it advisable to have a written contract with your employers, properly drawn up and signed, or is the letter or telegram engaging you for the job sufficient?

3. Can a lump sum be demanded in advance to cover all the expenses of the trip?

4. Can the company properly be charged with all of the equipment necessary for the work, outside of the personal necessities of the engineer?

5. About traveling expenses. (a) Are tips to servants, laundry bills, tobacco, ammunition, medicines, etc., legitimate expense items? (b) Is the engineer entitled to the best first-class passage on train and on shipboard, and to the best accommodations at hotels? (c) If the young man be of an economical turn of mind, is it right for him to travel second-class, or even steerage, and charge the company first-class, he pocketing the difference? (d) How minutely must the details of the expense account be kept? Are frequent charges of 'incidentals,' to cover small expenses, permissible? (e) Is it best to take vouchers for large expenditures? If so, over what amounts? (f) Can expenses incurred in entertaining men while getting pertinent information from them, be entered on the account? (g) If the expedition consumes say three months, should the statement of expenses and cash bal-

ance be rendered weekly, monthly, or at the end of the engagement?

6. If you are sure of your fee, is it a good plan to send periodical reports on the progress of your investigation, giving results, such as assays, as they are obtained in the course of the work, or is it better to withhold all this information until your final report? Is the company justified in demanding frequent periodical reports of this kind?

7. If your examination indicates to you that the shares should be worth more than they are selling for on the open market, is it fair to buy these shares, before your report is turned in? Is it all right to do so afterward? In other words, is it permissible to use information gained at company expense, for private gain, during or subsequent to your term of employment?

8. Is it legitimate to take advantage of your presence in a district, to examine, and perhaps option mining properties for yourself, provided your employers are not in the field to purchase new ground, and no time is lost that properly belongs to the company?

9. Should there be any objection to publishing, in technical periodicals, a description of the district visited, giving general information of the conditions obtaining there, the topographical and geological features, and conclusions concerning the possibilities of successful mining, provided, of course, your employers will suffer no direct injury thereby?

10. Is it always expected of the engineer to say 'yes' or 'no' to the property? Even though the property is comparatively undeveloped, or badly opened, and the facts obtainable are insufficient for an intelligent opinion, must the engineer always reach a definite conclusion? If the mine is an old one, badly caved, is the engineer justified in spending company money to clear out old drifts, unwater shafts, and open caved ground, and may this work be properly charged in his expense account, without definite authority for such work from his employers?

T. S.

San Francisco, September 18.

The Editor:

Sir—A discussion of the relations which should exist between a mining engineer and his client in respect of mine examinations will be beneficial if it tend toward the establishment of just standards. The crystallization of custom in this regard will undoubtedly promote the general recognition of the profession as a necessary safeguard of prudent mine speculation, until the difference between a mining engineer and the so-called 'mining expert' shall appeal to the layman with the same conclusiveness as that with which he has learned to distinguish between an architect and a builder.

I would accordingly offer the following suggestions in answer to your queries:

1. The payment of a salary presupposes an engagement of indefinite length. Custom is making for a per diem rate in the case of occasional work, such as a mine examination. This invariably includes time spent in travel and in the preparation of report.

2. A telegram or letter of engagement is as legally binding as a contract, if it refers specifically by date to a letter or telegram, of which press-copy has been retained, in which terms were proposed. A telegraphic proposal of terms should, however, be repeated back to the sender to make the transaction safe.

3. An honest client will tender a sum in advance sufficient to cover the estimated total expense of the examination. If he does not, the engineer had better remain at home.

4. An engineer is supposed to have the necessary instruments of precision for surveying and measuring the property and orebodies, but insurance against their damage through accidents in travel should be involved in the client's obligations. Other equipments should be purchased and charged in the expense account.

5. As to traveling expenses: (a) Until the world is reformed, reasonable tips to servants are unavoidable, hence legitimate; laundry bills are excessive when traveling, and the unavoidable excess is a proper charge; tobacco is a luxury, and no self-respecting man would charge such an item to his client; ammunition for sport is also a luxury, but ammunition for personal protection, or to get meat in the wilderness, is a necessary expense; medicines are as much a necessity as bread, but the average engineer carries his medical kit, the occasional replenishment of which is a small item. If medical aid for other than chronic ailments be needed, it may properly be considered an accident of the journey, the cost of which naturally falls upon the client. (b) The engineer is entitled to first-class transportation, unless otherwise nominated in the bond. (c) Being therefore entitled to first-class comforts of travel, it is his duty to maintain the dignity, as authorized representative, of his principal, by traveling like a gentleman. To travel meanly and pocket the difference is dishonest for a two-fold reason. (d) Details of expense should be kept with the utmost possible minuteness. In the hurry of travel, however, it is often impossible to record every item, but it is a good rule never to allow 'incidentals' to exceed five per cent of the total costs. (e) Obtain vouchers wherever possible. No rule as to amount can be fixed, as, for example, it is impossible to obtain vouchers for railway tickets, hack-fares, etc. (f) Ingratiation of the engineer with others through entertainment often leads to results of the utmost value to a client, and such expenses are legitimate, but the charge should be accompanied by an explanation of the necessity for such entertainment. (g) It is usually wiser to defer rendering statement of expenses until the conclusion of the work.

6. Progress-reports upon a simple examination are prone to be misleading. Unwarranted conclusions are likely to be drawn from them. The engineer is usually rendering a more valuable service by waiting until he has collated his data, and is in position to submit a matured judgment. If development of mines is involved in the work, progress-reports may be necessary.

7. The client is entitled to all the benefit of the knowledge acquired by his engineer. The engineer has no right to speculate as a result of knowledge obtained at his client's expense, unless done with his explicit consent. In fact, a mining engineer with a proper regard for professional ethics will not speculate in mines or mining shares while he offers his services to the public as a consulting engineer.

8. This question is answered above.

9. It is unprofessional to publish a description of a district visited in a client's interest without submitting the manuscript for his approval in advance of publication in order that he may determine whether in part or in whole the article may affect him adversely. The above restriction does not apply to observations made while traveling outside of the district in which the examination was made.

10. The engineer must of course give definite advice to his client. That is what he is paid for. This does not necessarily involve a simple 'yes' or 'no,' but definite recommendations in the light of the facts about the mine and the conditions affecting its successful operation, taking also into consideration the terms under which the client may be able to come into possession of

the property, must be fully and clearly set forth. The questions of unwatering, clearing out old workings, and of doing new exploratory work, must rest with the judgment of the engineer. The terms of his engagement, the importance of the data obtainable without doing such extra work, and the proportion which the cost of the extra work necessary to reach a conclusion will bear to the costs already incurred, will be determining factors. This is not a matter of engineering propriety, nor of professional ethics, but of common sense.

COURTENAY DE KALB.

Los Angeles, October 7.

The Editor:

Sir—Referring to the interesting series of questions appearing in your issue of October 5, I beg to give the following replies:

1. It is best to charge a fee unless uncertainty exists as to the length of time necessary for the examination, in which case compensation had best be arranged upon a salary basis.

2. As a matter of business, a written contract is preferable; but if the employer is known to be reliable and responsible, as is generally the case, the letter or telegram should be deemed sufficient.

3. I would consider it eminently proper to ask for a lump sum to cover all expenses of the trip if it is not voluntarily offered.

4. It is permissible to charge the company with all of the equipment necessary for the work, outside of the personal necessities of the engineer, with exception of surveying and such other engineering instruments, which an engineer is supposed to own.

5. (a) Tips to servants, laundry bills, tobacco, ammunition, medicines, etc., are perfectly legitimate expenditures, but they should be carefully regulated and minimized.

(b) The engineer is entitled to the best first-class passage on train and on shipboard, and to the best accommodation at hotels.

(c) It is *not* right to travel second-class and charge the company first-class, pocketing the difference.

(d) Itemized accounts should be kept. Most employers do not expect itemized statements of expenditures, but they should be rendered if asked for.

(e) It is best to take vouchers for large expenditures. I would consider \$5 a low enough limit.

(f) By all means, expenses incurred in entertaining men while getting pertinent information from them, may be entered on the account, but such expenses should be fully explained in rendering the account.

(g) The statement of account should be reserved until end of trip unless employer should request statements at fixed intervals, in which case the engineer can have no reason to object.

6. Advance information is often misleading, and in some cases might even have to be revised, so it is best to withhold reports of results until the examination is completed, or at least so far along as to enable the engineer to formulate his conclusion. The employer is justified in demanding reports as to the amount of progress made, but not in asking for definite conclusions until all facts obtainable are in the possession of the engineer. There are, of course, exceptions, where such advance information would be invaluable to the employer, and in such cases the engineer will have to use his discretion as to the extent to which he gives such information.

7. It may be fair enough for the engineer, with the knowledge and consent of his employer, to speculate in the shares of the property examined, either before or after the report is rendered; but it is better for him to have

nothing to do with any such transaction, as it would tend to bias his judgment, and he would incur the risk of having his motives impugned.

8. There is no reason why opportunities to examine, and perhaps option, mining properties for yourself, should not be grasped, provided that the employer is apprised of the facts and offers no objection.

9. There is no objection to publishing, in technical periodicals, a description of the district visited, giving general information of the conditions obtaining there, the topographical and geological features, and conclusions concerning the possibilities of successful mining, provided, of course, your employers will suffer no direct injury thereby. On the contrary, it should be encouraged.

10. An engineer would be recreant to the trust imposed upon him if he should give a positive opinion regarding a property which he did not consider warranted by the facts. His report should be 'yes,' 'no,' or 'doubtful,' and the reasons for such opinion should be fully explained.

The expenditure of the employer's money to reopen old ground is fully justified where it is necessary to do such work in order to obtain definite information bearing upon the value of the property examined. If, however, it involves any considerable sum, the employer should, if practicable, be first consulted, before the work is undertaken.

R. CHESTER TURNER.

Berkeley, Cal., October 2.

The Editor:

Sir—There must always be a beginning, but the assumption that a young engineer is capable of undertaking an extended examination when he has had no experience in work of this kind is open to severe criticism. Many engagements as an assistant are necessary before the engineer is competent to undertake the entire responsibility of an important examination.

The questions submitted are, however, answered strictly in accordance with the assumptions stated in the letter of inquiry. Customs vary in different places, and it may be found advisable to settle some of the questions by agreement. The aim of the writer is to guide the young engineer within ethical lines.

1. To charge a fee whenever the extent and nature of the work can be arrived at with a reasonable degree of certainty is more dignified, but there is nothing inherently wrong in undertaking the work on a salary basis.

2. Specific understandings are desirable. Exchange of letters or telegrams in which essential matters are made clear is sufficient where the client is responsible. If the responsibility of the client is uncertain, decline the examination unless sufficient funds are advanced to cover expenses, and the amount of the fee is deposited in a bank to be paid on the presentation of the report.

3. Unless remittances are certain to be received when required, a sufficient amount should be advanced in the first instance to meet all expenses as they arise.

4. Certainly the client can be charged with all equipment necessary for the work outside of personal articles and luxuries; but it must be remembered that all unused equipment at the conclusion of the engagement is the property of the client.

5. The engineer should travel in the manner to which he is accustomed, but extravagance is not permissible in any case. To travel second class and charge first class rates is simply stealing the difference. While the expense account submitted need not go minutely into details, it is desirable to keep exact accounts of all expenditures; frequent charges of incidentals is not advisable. Vouchers should be taken when possible for all expenses. If information is obtained from the client that

warranted the outlay, the expense incurred in entertainment should be charged. Accounts should be furnished monthly if clients should so desire, otherwise at the end of the engagement.

6. If clients desire, there is no objection to submitting statements of fact as work progresses; this would be particularly desirable and necessary if the work was carried on under the instructions of a consulting engineer.

7. It is best that a young mining engineer own no mining shares, certainly not in any company with which he may be professionally connected.

8. In the absence of agreement to the contrary all options or information obtained belongs to the client.

9. There is no objection to publishing articles providing the consent of the client (in whose service the information was obtained) is received. On the contrary, it is most desirable. Every professional man owes something to his profession, and this is one way to pay installments on that debt.

10. More or less money must always be spent in clearing out workings before actual examination begins. It should be kept clearly in mind, however, that such expenses come under the head of money spent for the privilege of examining, and it rarely pays to spend much that way. In most cases the owner should undertake such work, if advisable at all. Engineers should certainly give specific advice based on the obtainable facts.

H. D. S.

San Francisco, October 4.

The Editor:

Sir—I take pleasure in giving below my opinions with reference to the questions asked by your correspondent, T. S., which seem to me very pertinent. I believe it would be exceedingly desirable if a more definite code of professional ethics could be established among mining engineers.

1. A professional opinion should preferably be charged for by fee rather than by salary. The essential object of an examination is the expression of an opinion, the value of which depends mainly on the engineer's ability and reputation, rather than the rendering by him of specific services. A usual and proper arrangement is the payment of a definite fee, in addition to a *per diem* payment for time engaged in the examination, directly or indirectly.

2. This all depends on the client. As a general rule, I should be inclined to say that when you are dealing with people of whom you know so little, or of whom your knowledge is so dubious, as to make it necessary to have a written contract, it would be better to demand and receive your fee in advance.

3. Yes. If the journey is a long and expensive one it is advisable, as well as proper, that an amount sufficient to cover all the estimated expenses should be paid in advance.

4. Yes. But surely an engineer is supposed to be reasonably well equipped with the instruments necessary for the exercise of his profession, just as much as with the requisite knowledge and experience.

5. (a) Yes. (b) Yes. (c) It may be right from an ethical point of view, but is surely inexpedient. (d) Expenses need not be noted in great detail. For short trips, my own practice is merely to note the amount of money taken with me, and that with which I return, and charge the difference to expenses, after deducting any obvious private outlay I may have made *en route*. (e) Yes, but vouchers are desirable, not so much for purely personal expenses as for other expenditures incurred by the engineer, such as for work done or for

possible to state any definite limit which should regulate this matter. (f) Yes. (g) When the examination is completed.

6. Your client may reasonably demand periodical reports as to results obtained during the progress of an examination, but in his interest, as much as your own, great care should be exercised in sending only such facts as you consider to be conclusively established. Do not volunteer provisional information unless it has been specifically asked for. The fewer half-digested opinions you form or express, the better.

7. To the first question my reply would be, emphatically, no. To the second, yes. But whether it is ever really desirable to make use, for the purpose of speculation, of information gained professionally, is a very doubtful question, as to which no general rule can be stated. It may seem a "counsel of perfection," but I should like to see all engineers taboo speculation in securities of enterprises with which they are connected, and I would even extend this to include enterprises with which they have been connected, and are likely to be so again.

8. No; unless there has been a previous distinct understanding to that effect between yourself and your employers. In the absence of such understanding, should you acquire options in a district where you have been present in the interests of others, they should be given an opportunity to avail themselves of them.

9. No. But statements as to the individual property to which your visit was made should be published only with your clients' sanction. Experience will usually guide the engineer in deciding correctly what information should or should not be published.

10. This question can hardly be fully answered without writing a volume. I am afraid it is always expected of the engineer that he should say 'yes' or 'no' with reference to the property; and often without sufficient information as to the essential factors, such as price, terms, and other conditions, on which alone any such answer should be based. Obviously the engineer can reach no more definite conclusion than the facts available will warrant. It may be necessary for him to report frankly that there were insufficient data to justify him in expressing a final opinion as to the value of the property, in which case he should state whether, in his judgment, the conditions warrant the expenditure of such time and money as will supply the deficiency. If workings are inaccessible on account of water, caved ground, etc., he should certainly consider himself justified in incurring a reasonable expense in opening them, and his own common sense, together with the commercial interests involved in his examination, must guide him as to the amount of such expenditure; but if at all considerable, the engineer, if he is wise, will endeavor to get into communication by wire with his client before he undertakes it.

GEORGE E. COLLINS.

Denver, October 4.

Weathered Pyrite.

The Editor:

Sir—An interesting query is raised in the issue of September 14, regarding the formation of the oxides of iron from the weathering of pyrite in arid regions.

Under ordinary weathering conditions, pyrite and other iron minerals will alter to the brown hydrous oxide of iron, consequently this is the most universally distributed form of iron. The process of change is often quite complex and not explainable by a single chemical reaction. Pyrite in oxidizing passes through the vitriolic state and then to limonite, often by such gradual

stages that the structure of the pyrite remains unchanged and the very common pseudomorphs of limonite after pyrite result. By age, pressure, heat, or simple dessication limonite may become dehydrated and form deposits of the red oxide or of the black crystalline hematite and magnetite. Outcrops of limonite in arid regions may become dehydrated by simple dessication and the red oxide croppings are more likely to occur in such regions than elsewhere.

Crystallized or specular hematite and magnetite are commonly constituents of the igneous and metamorphic rocks and deposits of them are generally associated with crystalline rocks. They are not products of weathering but of metamorphism in general. Pseudomorphs of both after pyrite are known to occur, but they are rare, especially magnetite pseudomorphs. The association of crystalline limestone would account for the formation of the anhydrous oxides. Pyrite altering in the presence of limestone usually forms limonite, the solution of bicarbonate of lime carrying off the sulphuric acid and leaving the hydrous oxide of iron. Magnetite can be formed by the action of alkali sulphates on iron; consequently, in arid alkali regions the decomposition of pyrite or other iron sulphides in the presence of the alkalies may account for the croppings of magnetite. The passage of the three oxides, limonite, hematite, and magnetite, into each other by simple hydration and dehydration is abundantly seen in nature, but in the case of the iron sulphides, hydration forms sulphuric acid and introduces a factor which complicates the weathering action.

ARTHUR S. EAKLE.

Berkeley, October 8.

CALCINING PLASTER.—A general plan of calcining plaster is as follows: The gypsum rock is crushed first in a jaw crusher; second, in a pot crusher; and then it goes to a rotary kiln drier. This drier is erected in brickwork like a boiler, and is equipped with an automatic feeder. If soft coal or wood is used as fuel, care must be taken that the products of combustion do not come in contact with the materials being dried, on account of the danger of discoloration. Fuel of any kind—oil, gas, coke, wood, or coal—is suitable. This drying process eliminates 10% of moisture. Next, the crushed rock is sieved in a trommel, generally to 24 mesh. The material that does not pass the sieve is ground in buhr mills, and this product, with the screenings from the trommel, is ready for boiling. The boiling is done in a large kettle with wrought-steel sides and cast-iron or heavy steel convex bottom. Flues pass through the kettle near the bottom and distribute the heat, which is applied below the kettle, and passes around the lower part of the sides, through the flues, and then around the upper part of the sides, and out at the stack. Inside the kettle is a shaft, which propels stirrers below the flues and mixing paddles above. The kettles are heavy and rest on brickwork. The ground gypsum is fed from bins into the kettle, and is constantly stirred and boiled until the remainder of the free moisture is expelled. The temperature of this preliminary boiling should not exceed 265° F., for at a higher temperature the water of crystallization, or combined water, begins to separate, and then the separation must be completed or the calcination will be a failure. To remove the necessary three-fourths of the combined water the material is then heated steadily to a temperature of 395° F. Care must be taken not to allow the temperature of this second boiling to exceed 400°, or all the combined water will be expelled, and the plaster will lose its setting properties.

Rules for the Guidance of Employees Underground.

Written for the MINING AND SCIENTIFIC PRESS
By R. CHESTER TURNER.

Few mines publish rules for the guidance of their employees, but it certainly is a commendable practice, as it safeguards both employer and employee and relieves the mine-foreman and shift-boss of the necessity for constantly reminding their men of many things that they should know without being told. It serves to put the miner, particularly the green hand, upon his guard against many of the dangers incident to his work, and it aids materially in the general disciplining of the mine force. It also, in many cases, relieves the company from responsibility for accidents due to carelessness of employees; besides, the enforcement of the rules will often save company property from serious damage or injury, and add materially to the efficiency of the working force.

Two codes of rules are given below. The first is in force at the Standard mine at Bodie, Cal., and the second is the list adopted by the Tonopah Mine Operators Association, and in force at the principal mines of the Tonopah district. Neither list is either perfect or complete, and it is with the hope that others of your readers may come forward with suggestions for their improvement, either by a process of addition, elimination, or revision, or by a combination of the three, that they are offered for publication, the idea being to eventually evolve a composite code of rules that will have general application. At nearly all mines some rules would have to be revised and others added in order to meet local conditions, but such a general code as it is desired to finally obtain would serve as a guide in almost all cases. The lists are as follows:

REGULATIONS OF STANDARD CONSOLIDATED MINING COMPANY.

POWDER must be thawed only in the appliances provided for that purpose. Powder fuse and caps always must be kept in boxes.

Miners are forbidden to use a tool of iron of any kind to load or tamp holes.

All missed holes must be reported to foreman or shift boss when miners are going off shift.

Holes shall be fired only at end of shift and just before meal hour, unless directions to the contrary are given by the foreman or shift bosses.

THE HEATING of lunches by means of candle snuffs will only be permitted in places specially designated by the foreman or shift bosses.

Miners are specially cautioned against dropping lighted snuffs.

Positively no lights must be left burning upon departure of shift, or at any time when leaving working place.

WHEN WORK is discontinued at any working place, miners working there last are expected to report to the foreman or shift boss the leaving of tools or supplies at that point.

TIMBERS, tools, etc., must not be left in raises or manways.

Miners starting to ascend or descend manways, must give notice of their coming and wait for answer from those above or below, if there are any, before proceeding.

Throwing tools down manways or chutes is strictly forbidden.

ANY MINER discovering bad or dangerous places in this Company's mines, will at once notify the foreman or shift boss.

No miner will lose his position by declining to work in a dangerous place.

THE TUNNELS and workings of the mine are for the use of the Company and its employees only. Peo-

ple desiring to visit the same must apply at the office for a pass.

No employee shall take strangers underground without a pass.

Tunnel carmen and shift bosses are expected to report at once any violation of this rule.

LEAVE OF ABSENCE must be applied for the day before.

Where absence is unforeseen, as in case of sudden sickness, word must be sent to the foreman or shift boss before the shift is due.

BELL SIGNALS as posted must be strictly followed. The station tender only is authorized to handle the bell rope.

Miners must not ride on a loaded cage.

ALL EMPLOYEES ARE EXPECTED TO READ AND POST THEMSELVES UPON THESE RULES.

FAILURE TO COMPLY WITH THE ABOVE RULES WILL RESULT IN SUSPENSION FROM THE ROLL.

RULES AND REGULATIONS ADOPTED BY THE TONOPAH MINE OPERATORS ASSOCIATION.

IN FORCE IN THE MINES OF THE TONOPAH DISTRICT.

1. **MINERS** are expected to clean down all loose rock in the roof and walls of the working places to which they are assigned before proceeding with any other work in such places.

2. **THROWING TOOLS** down manways is strictly prohibited.

3. **FUSE, CAPS, AND POWDER** must not be left lying in the stopes and working places, but must be taken, when near, from the supply points designated for the purpose. In taking powder, where a portion of a stick is used, the balance of the stick must either be used with the next charge, or else returned to the box from which it was taken, and in no case must it be thrown on the floor or in the gob and left there.

TAMPING with steel or any metal tool is strictly prohibited. Wooden tamping rods must be used for this purpose.

4. **MISSED HOLES** must be reported to the foreman or shift boss upon coming off shift. Write down the situation of such missed holes upon the black-boards or paper provided for that purpose.

5. **EMPLOYEES** are expected to report at once to the foreman or shift boss any dangerous condition about the workings that may come under their observation.

6. **IN THE EVENT** of anything, such as timber, tools, etc., dropping into the shaft, the cage tender must make a thorough investigation to satisfy himself that the shaft is clear before any further hoisting is done, and he must report accordingly to the foreman or shift boss.

7. **BELL-LINE.** Where a cage tender is employed, the bell-line is to be handled by him only except where an authorized employee wishes to go from the surface to a level above that from which the cage tender is hoisting, and in that event, he must ring one bell to notify the engineer that the cage is released after landing at his destination. In all cases the published code of bell signals must be observed.

8. **GATES.** When the cage is not at the station, the shaft-gate must be kept closed, and in every case it shall be the duty of the person operating the bell-line to lower the shaft-bar before the cage leaves the station.

9. **LIGHTED SNUFFS** must not be left at the stations or near any timber, unless in some receptacle specially provided to hold same.

10. **ALL EMPLOYEES** are expected to read these rules and post themselves regarding same. Ignorance of the published rules will not be considered a valid excuse for any violation of the same.

The bell-signals and rules in force at Bodie are those of the California State Code, and they are practically the same at Tonopah.

The Desert Mill.

Written for the MINING AND SCIENTIFIC PRESS
By A. R. PARSONS.

The 100-stamp mill and power-plant of the Desert Power & Mill Co., operated by the Tonopah Mining Co. of Nevada for the purpose of milling the ore produced from its Tonopah mines, is situated at Millers, Nevada, a station on the Tonopah & Goldfield Railroad 13 miles west of Tonopah.

The entire installation, both mill and power-plant, was made by Chas. C. Moore & Co., of San Francisco, to whom a contract for the work was given. A little over one year was required to complete the mill. Mr. John H. Hopps of San Francisco acted as consulting engineer.

The power-plant contains four Babcock & Wilcox water-tube boilers of the vertical header type, provided with superheaters, set in batteries of two each. Each boiler contains 2,036 sq. ft. of heating surface. The boilers are arranged for firing with either coal or oil; the Moore oil-burning apparatus is used. Natural draft is obtained by means of a 66-in. steel stack 150 ft. high. A Green fuel-economizer utilizes the flue-gases. The minor boiler-room equipment consists of two Snow duplex boiler-feed pumps, Goubert feed-water heater, automatic relief-valves, stop and check-valves, damper-regulator, hot well, steam-traps, feed-water meter, thermometer, etc., all of which is ample and well arranged.

There are three 14 by 28 by 30 in. horizontal cross-compound side-crank McIntosh & Seymour gridiron-valve engines, each condensing, arranged for direct connection to 250 kw., 25 cycle, 2,200 volts, 150 r.p.m. alternators. There is also one 15 by 32 by 30 in. McIntosh & Seymour engine as above, directly connected to a 300-kw. alternator. All electrical equipment was furnished by the Westinghouse Electric & Manufacturing Co. The exciting current is supplied by 125-volt direct current exciters, belted from the band-wheel of the generators.

Condensation of steam from the engines takes place in Edwards condensers, equipped with power-driven air-pumps. The circulating water for condensing is pumped, by means of 8-in. double-suction Wheeler centrifugal pumps directly connected to 40-hp. motors, to a fan-driven steel water-cooling tower. Suitable switchboards with generator panels and distributing boards for mine and mill are conveniently placed in the engine-room. Step-up transformers raise the voltage from 2,200 to 22,000 for transmission over the 12-mile line to the hoists at the shafts in Tonopah. Step-down transformers lower the voltage at the mill from 2,200 to 440, all the mill-motors being 25 cycle, 440 volt Type C.

Water for the mill and power-plant is pumped by a two-stage vertical centrifugal pump from a well 60 ft. deep, situated 1,700 ft. north of the plant.

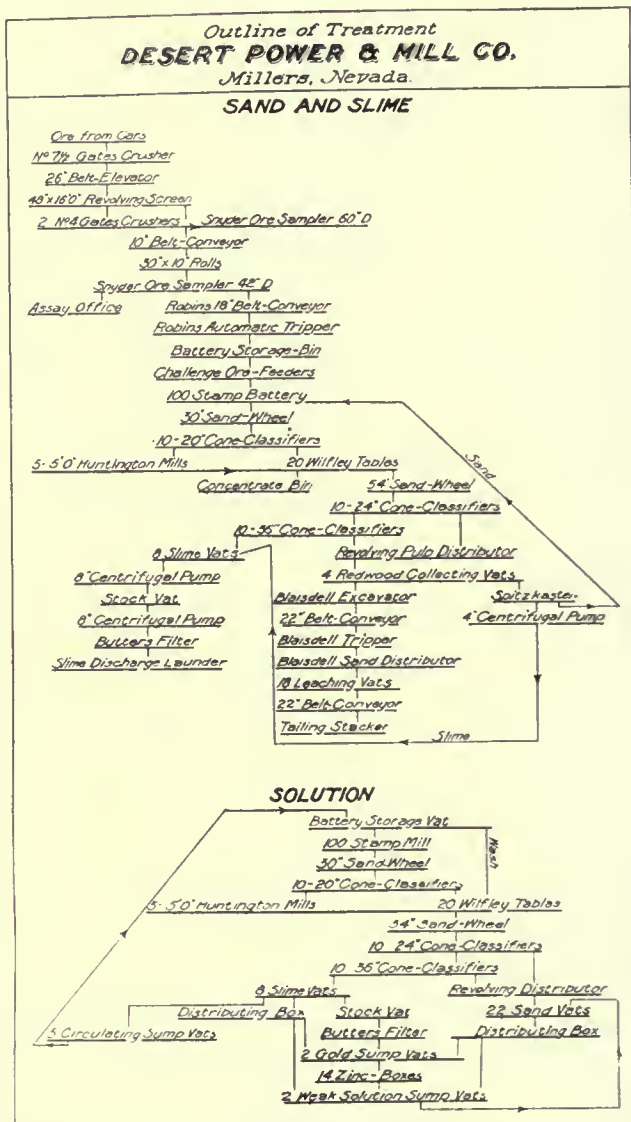
The main mill-building, 525 by 230 ft. in extreme dimensions, is erected on ground having only a 3% slope. The crude ore from the mines is taken up an incline trestle in steel hopper-bottom 50-ton railroad-cars in lots of seven cars to the crusher ore-bin.

The orebodies of Tonopah are largely replacements of andesite by quartz, forming parallel or branching veins and veinlets of quite solid quartz, separated by mineralized andesite, which frequently assays well. The ore as stoped, is therefore a mixture of quartz and 'porphyry.' Some of the early barren porphyry is sorted out before the ore is sent to the mill.

The primary ore of Tonopah consists of a gangue of quartz with some sericite and adularia, with a small percentage of the carbonates of lime, magnesia, iron, and manganese; the silver is present mostly as sulphide and

sulphantimonide; gold is never visible and occurs in some form not yet determined; small amounts of pyrite and chalcopyrite occur, with traces of lead, zinc, arsenic, selenium, and other metals.

All of the ore now being treated at the Desert mill is partially oxidized. This oxidation, however, is never complete and most of the silver is still present in the form of argentite, which is probably mixed with stephanite, but in the more oxidized phases cerargyrite (horn silver), frequently containing iodine and bromine, is common. The carbonates of the primary ore are represented by oxides of iron and manganese, and gypsum. In the process of oxidation, a large proportion of the



iron, manganese, antimony, arsenic, copper, lead, zinc, and selenium originally present, has been removed. In none of the ore, however, are the base metals present in sufficient quantity to be valuable.

A sample of rich ore from the Valley View vein analyzed by Hillebrand of the U. S. Geological Survey gave the following results:

Ag	62.51%	(38.10 as sulphides, 24.41 as chloride, sel- inide, and alloy.	Au	0.62%
			Fe, Mn	1.46%
			Cu, Pb, Mn	0.51%
			Se, Sb, As	0.96%

The ratio of silver to gold by weight in the ore treated at the mill is about 90 to 1.

The coarse-crushing and sampling department is in a separate building. The crushing plant has a capacity of 400 tons in 8 hours. Power for driving the machinery is supplied by a 125-hp. motor and the 18-in. Robins belt-conveyor for carrying ore from the crusher-house to battery storage-bin is driven by a 15-hp. motor.

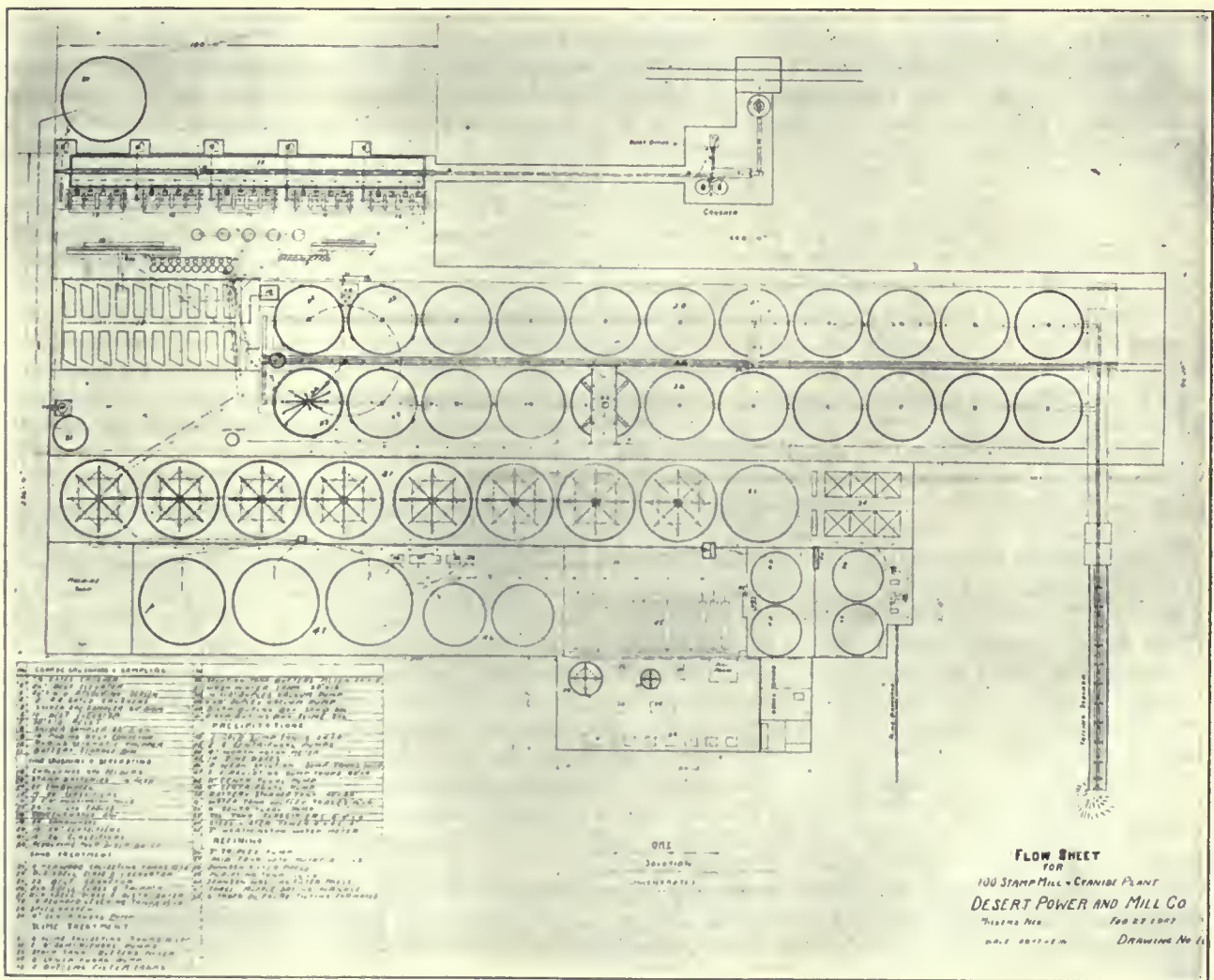
The mine-run from the bin is fed through a finger

gate to a 7½ Gates crusher, Style K. This reduces it to a maximum size of about two inches, in which condition it is elevated by means of a 26-in. steel bucket-elevator to a 48 in. by 16-ft. revolving manganese steel screen with 1½-in. holes. The oversize from the screen passes to two 4 D Gates crushers for further reduction. The product from the smaller crushers unites with the screened product and passes through a 60-in. Snyder sampler. The reject from the sampler falls directly upon the 18-in. conveyor. The cut out from the sampler is elevated by a 10-in. steel bucket-elevator to a set of 30 by 10-in. rolls for fine grinding. The product from the rolls is passed through a 42-in. Snyder sampler, the reject from which falls upon the conveyor and the 'cut out' is taken to the assay office for further sampling and pulping. The 18-in. conveyor with troughing idlers

12-mesh wire screen, the height of discharge being three inches.

Chrome steel shoes and dies have been in use and cast iron dies containing a percentage of steel are being tried with satisfactory results, a more even wear of both shoes and dies being obtained by the combination. Both shoes and dies are worn down to a thickness of less than two inches, compensation for loss of depth being made up by cast iron false dies of varying thickness. The chrome steel dies average 1,736 stamp-hours, crushing 315 tons of ore each. The shoes average 1,011 stamp-hours, crushing 285 tons each. The steel consumption of dies and shoes is respectively 6.70 and 7.60 oz. per ton of ore crushed.

The battery-crushing takes place in a solution carrying 0.15% potassium cyanide, supplied from a 188,000



takes the ore up a 22° incline and distributes it by an automatic tripper over the battery storage-bin, having a capacity of 1,500 tons.

Rack and pinion gates regulate the ore going to the 20 Challenge feeders, supplying the 100 stamps. The mortars of the stamp-batteries are the narrow pattern, single discharge, manufactured by the Union Iron Works. They are set on substantial concrete foundations down to hardpan, rubber sheeting ½ in. thick being placed between the mortars and the top of the concrete. End and side liners of malleable cast-steel are used in the mortars.

Each battery of 20 stamps is driven by a 50-hp. motor, the order of dropping stamps being 1-3-5-2-4. The weight of each stamp is made up as follows: Stem, 427 lb.; tappet, 140; boss, 320; and shoe 180 pounds.

The stamps drop 104 times per minute through a height of 6½ in. and have a duty of 4.34 tons crushing through a

gal. storage-vat that is filled by 8-in. Butters centrifugal pumps, taking their suction from sumps at the lower end of the mill. The pulp from the battery (7 of solution to 1 of ore) flows to an inside bucket-elevator wheel, 30 ft. diam., driven by a 7½-hp. motor. The wheel elevates the pulp to ten 20-in. double cone-classifiers with hydraulic upward current of cyanide solution. Sizing tests:

Screen Mesh.		Battery product.	Overflow from classifiers.		Splat discharge.
			%	%	
On 20	.....	6.82	0.21	4.10	
" 30	.....	17.58	3.71	23.27	
" 40	.....	8.85	3.42	11.37	
" 50	.....	10.32	7.04	20.46	
" 60	.....	2.83	5.10	8.30	
" 80	.....	10.62	13.85	13.39	
" 100	.....	10.82	15.90	6.67	
Pass 100	.....	31.77	50.30	11.65	

The overflow from the classifiers passes directly to ten

No. 5 Wilfley concentrators. The bottom-discharge through $\frac{1}{2}$ -in. spigots, containing the coarse product for re-grinding, flows to five 5-ft. Huntington mills, equipped with 30-mesh screens. Three mills ordinarily re-grind the oversize product from 80 stamps. A 50-hp. motor drives the mills and a bucket-elevator for raising the product from the mills for distribution over the 10 concentrators.

The 20 Wilfley concentrators are securely anchored to a concrete floor with sufficient slope to allow drainage of any leaks or drips to the tailing-launders beneath the level of the floor, the launders also being made of concrete. The tables make 240 strokes ($\frac{3}{8}$ to $\frac{1}{2}$ in.) per minute, the length of stroke varying with the class of material passing over each table.

Classification and dewatering of the product to the Wilfley concentrators is obtained by a series of V-boxes receiving the pulp from the launders carrying the overflow from the 10 double-cone classifiers and re-ground product from the Huntington mills. It is intended to install additional concentrators to take the middling from the present equipment, as experiments have demonstrated that an additional saving of about 10% can be made in concentrating, at the same time removing sulphides difficult to treat in the cyanide department. At present, 90 tons of ore produce 1 ton of concentrate, averaging 4.5 oz. gold and 815 oz. silver per ton. These are partially dried to about 12% moisture by draining and vacuum applied to a small vat receiving each day's output. The concentrate is sacked each day in canvas bags and shipped to the smelter in carload lots. The recovery by concentration from March to August, this year, was 15.63% of the gold and 30.32% of the silver contents of the ore milled.

A 30-hp. motor operates the 20 Wilfley concentrators, one 4-in. Butters centrifugal pump used for pumping wheel-pits, a Johnston vanner (used in experiments), and a small bucket elevator.

The tailing from the concentrators is elevated by means of a 54-ft. wheel to two sets of ten double-cone classifiers with hydraulic upward current of weak solution. The overflow from the upper set of 24-in. classifiers goes to the lower set 36-in. diam. The overflow slime and solution from the lower set of classifiers flows to the slime plant through a series of spitzkasten for removing the very fine sand.

The sand and solution from $\frac{3}{8}$ -in. spigot-discharge of both sets of classifiers and spitzkasten flow through a wooden launder to a revolving wet distributor of the Butters & Mein type. This distributor is hung from a circular overhead trolley so that it can be swung to any one of four sand-collecting vats. These, as well as the 18 leaching-vats, are 33 ft. diam. by 8 ft. deep, provided with cocoa-matting and 10-oz. canvas filters laid on wooden strips, the filters being raised three inches above the bottom of the vat. The collecting-vats are provided with roller blind-overflow gates for a further separation of sand and slime. Some sand that overflows with the slime from these gates, is removed by a large pointed box receiving the entire overflow from collectors. The slime and solution from the pointed box are returned to the launder going to the slime-plant by means of a 4-in. Butters centrifugal pump.

For treating the sand, a collector is filled to a depth of five feet; this amount of packed sand, after transfer, fills a treatment vat. After a collector is filled, the distributor is swung to one of the other collectors, and the drain-valves opened for 21 hours; then a vacuum is applied to dry sufficiently to permit of excavating by means of a Blaisdell class A disc-excavator. This machine is mounted on a track and can be moved by electric motor

and trolley to any sand-vat. A wrought-iron conical plug 22-in. diam. seated on a rubber gasket in a cast-iron flange in the vat is removed by means of a chain-block attached to the excavator. This leaves a clear opening from the top of the sand to the 20-in. Robins troughing-belt conveyor running below each row of vats, through which the excavator discharges the sand. It requires from 2 to 3 hours to excavate 250 tons of sand, the time depending upon the moisture in the material. The excavated sand is conveyed to a cross-conveyor at the east end of the sand-vats. The cross-conveyor, running up an incline, discharges to a conveyor of the same type running between the two rows of vats and above them, over a Blaisdell class A tripper. From the tripper, the sand falls upon the cross-belt of a Blaisdell class Z sand-distributor, then on to a rapidly revolving disc with speed-regulating device by means of which the sand is distributed about the vat in a fine shower, and at the same time, thoroughly aerated.

While transferring the sand from collectors to leaching-vats, lead acetate, previously dissolved in water ($\frac{1}{2}$ lb. per ton) is allowed to drip upon the sand on the conveyor-belt and slacked lime (4 lb. per ton) is thrown into the collector in which the excavator is working, thus thoroughly mixing the lime with the sand. After transferring, a little shoveling is done to level the sand. The first leaching solution, amounting to 30 tons, is brought up to 0.25% strength by the addition of a sufficient amount of potassium cyanide solution of known strength to the vat undergoing treatment. This pumping of strong solution is allowed to drain slowly through the partially opened drain-valves and is followed by repeated pumpings of weak solution from 0.15 to 0.20%, after which the charge is drained for transfer. This first treatment occupies five days, including time of transfer.

The second treatment averages five days and consists of repeated pumpings of strong and weak solution, that are drained and the sand transferred to another vat for the final treatment, which consists of as many pumpings of wash solution as there is time to apply, followed by two or three pumpings of water to displace all the solution. Then the vat is finally drained by vacuum for discharging from the plant. All pumpings of solution are allowed to disappear below the surface of the sand before the succeeding one is applied. Sand undergoes treatment for 12 to 15 days. Moisture in sand discharged averages 15%. Sand residues at present average 0.03 oz. gold and 3.10 oz. silver per ton.

-sizing test on sand residues.

	Screen Mesh.	Percentage.
Remaining on.....	20	0.15
" ".....	30	11.64
" ".....	40	13.98
" ".....	50	12.31
" ".....	60	10.48
" ".....	80	17.54
" ".....	100	12.77
Passing.....	100	21.05

The treated sand is discharged by the excavator upon the sand-conveying system, so arranged as to run in the direction opposite to that when transferring. The sand as it is discharged falls upon a cross-conveyor running up an incline of 25°. As the tailing-pile builds up to the stacker, an extension of 18 ft. is added at the end. Arrangements are being made for a cross-conveyor in connection with the stacker.

All leachings from the sand-vats, as well as the plant solutions, are sampled, assayed, and titrated for cyanide and alkalinity daily. Attenuated leaching solutions are sent direct to weak sumps. Centrifugal pumps, when not pumping to treatment-vats, are in service circulating solution in sumps through cones for the purpose of aerating.

All potassium cyanide used in the treatment of sand, is dissolved in a small vat from which a 2-in. pipe-line is connected to the suction of a 4-in. centrifugal pump used to pump solutions on sand. By means of a table and float arranged on the vat, the desired strength of solution can be obtained by opening the 2-in. line and allowing the requisite amount of standard solution to be drawn through the pump with the weak solution from the weak sumps.

The slime plant has eleven 3-in. redwood vats 36 ft. diam. by 20 ft. deep for collecting and agitating slime; one vat of the same dimensions used in connection with the Butters filters for stock pulp, two Butters filter-vats containing 96 filter-frames each and two tanks 24 ft. diam. and 12 ft. deep used for weak solution and water for washing slime on filters.

All of the 11 vats mentioned above are provided with rim overflow launders for receiving the clear overflow when collecting slime. The overflow goes to any of the three sump-tanks, 40 ft. diam. by 8 ft. deep, from which it is returned to the battery storage-tank by means of an 8-in. centrifugal pump. Eight of the eleven vats are provided with mechanical arm-agitators driven by a 30-hp. motor with gearing and friction-clutches over each vat. Agitators make 5 rev. per min. There are two sets of four-arm agitators quartering. The lower set, to which drags are hung for keeping the heavier fine sand in suspension, is 2 ft., and the upper set 8 ft., from the bottom. Any of the eight vats can be used for agitation although at present but four are in use at the same time, leaving four of the agitation-vats and the three regular collectors for service in receiving and collecting the slime in the slime-bearing solutions. A charge of slime is drawn from the bottom of the collecting-vats by means of an 8-in. centrifugal pump without interrupting the collecting.

Previous to receiving a charge of thick pulp from the collectors, about 150 tons of barren solution is pumped into the agitator. To this is added 1,000 lb. slacked lime and 600 lb. dissolved cyanide; the whole is agitated for one hour by the mechanical agitators and pumps. The charge of thick pulp is then pumped in. When thoroughly mixed, it has an average specific gravity of 1.144, that is, 21 parts of slime to 79 of solution. The mass is agitated for 30 hours, the mechanical agitation being assisted by compressed air, admitted through a perforated pipe running half across the bottom of the vat and by an 8-in. centrifugal pump, taking pulp from the bottom and discharging at the top of the vat. This is used when not in service for other pumping. At the end of 30 hours, the agitation is stopped and the pulp allowed to settle for six hours, when about five feet of clear solution is decanted and run to the storage-vats for precipitation. The settled slime is then pumped to a second agitation-vat into which solution equivalent to that decanted has been pumped; agitation is continued for 24 hours, when the contents are delivered to the Butters filter stock-vat.

The following table gives the average time of each operation in the Butters filter, from filling the vat to discharging the cake.

	Minutes.
Filling with slime.....	22
Collecting cake, 23 in. vacuum.....	45
Pumping back slime.....	20
Filling with barren solution for wash.....	20
Washing cake, 23 in. vacuum.....	30
Discharging cake.....	3
Settling wash.....	5
Running back wash to vats.....	30
Pumping discharged slime.....	10
Total.....	185

Pumping in connection with the Butters filters is done by an 8-in. centrifugal pump, driven by a 20-hp. motor.

Vacuum for the filters is supplied by a 10 by 10 in. duplex vacuum-pump, driven by a 15-hp. motor. All valves in connection with filtering operations are operated from a platform by a system of rods and levers. The first solution coming through the vacuum-pump, upon beginning a new cycle of operations, is turbid and goes to the circulation sumps. When the solution becomes clear, usually in five minutes, it is turned to the storage-vats for precipitation.

The thick slime-cake, having been discharged, is broken up for pumping by means of 1-in. jets of water under a 70-ft. head directed downward into the hopper of the filter-vats. A duplicate pumping system is being installed to make it possible to either diminish the time of a cycle of operations or allow more time for washing. A large launder for running back wash-solution will also change the time when completed.

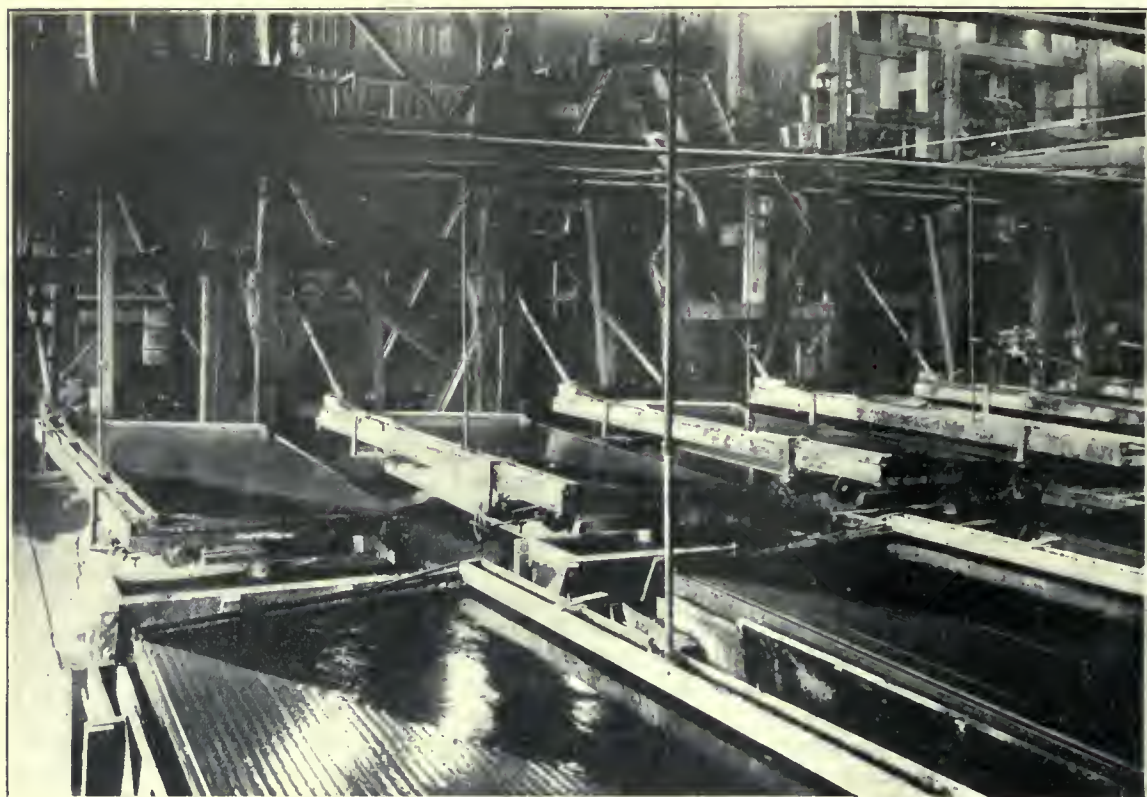
A mixture of air and water was tried for discharging cake but it was found that without careful attention and manipulation too much pressure would be used by the operator, thereby breaking the stitching in the filter-leaves. Accordingly, the cake is now discharged in the wash-solution by admitting water under a 12-ft. head. The wash-solution is allowed to settle for about five minutes before running back and then is drawn off to within about six inches of the thick slime in the hopper. By this means and the small amount of water from the jets, the slime can be easily pumped out with a moisture contents of 60%. At the present time, an average of 125 tons of dry slime is being filtered and discharged per 24 hours.

All solutions for precipitation are collected in two tanks, 24 ft. diam., 8 ft. deep. From these the solution is pumped through a 4-in. Worthington meter to the zinc-boxes by means of two 3-in. Byron Jackson centrifugal pumps, directly connected to 2-hp. motors. The precipitation room has a concrete floor sloping to a sump for drainage and collection of any drips or leaks.

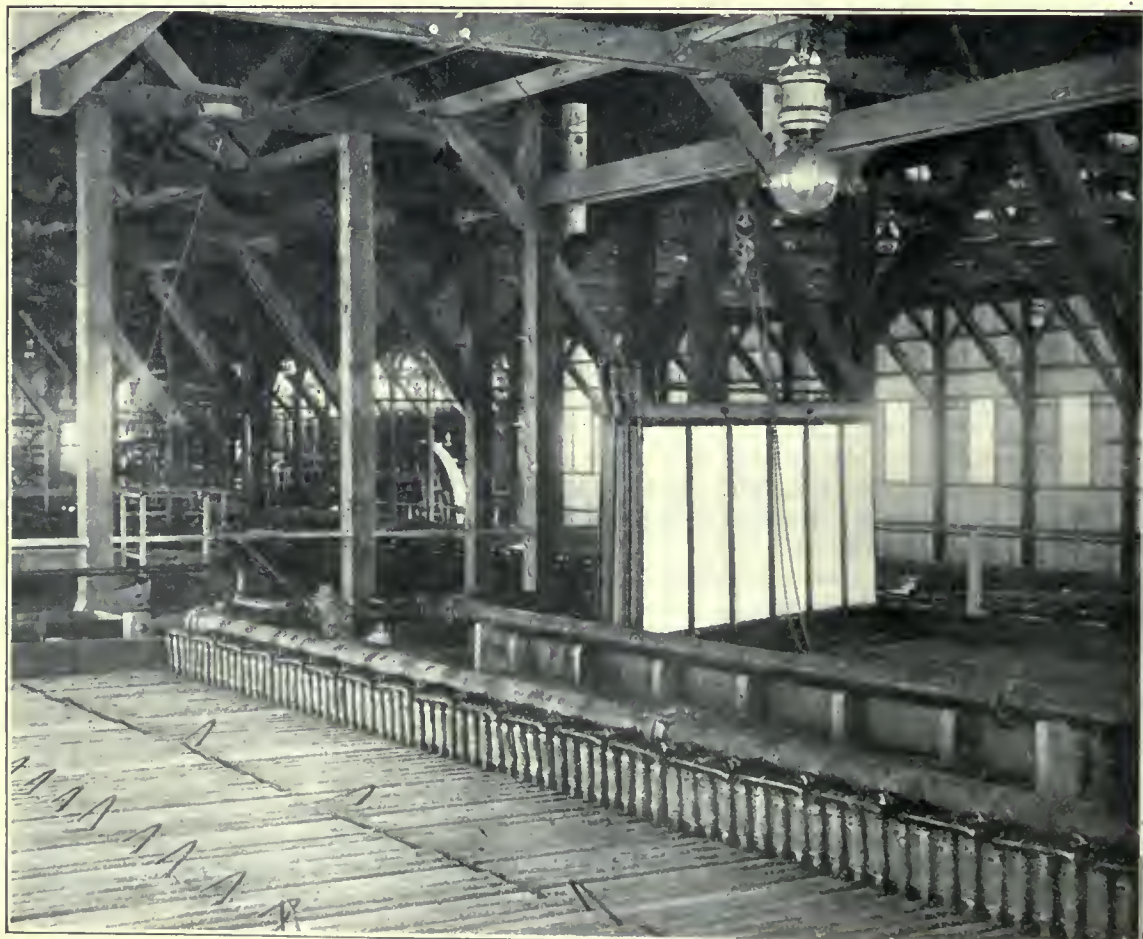
There are fourteen zinc-boxes made of three-inch redwood. Each box has seven compartments, each holding 15 cu. ft. zinc shaving above the screen-trays, making the total capacity of the box 105 cu. ft., or about 1,600 lb. zinc shaving. The compartments of the boxes are arranged for an upward flow of solution.

The average amount of solution precipitated in 24 hours is 1,200 tons; the tailing from the zinc-boxes assays from a trace to 11 cents per ton, increasing in value from the time immediately after one clean-up to the time of the next. Four clean-ups are made each month; five men working over-time with two men from the melting-room make the clean-up of fourteen boxes in two days. During the first one the shaving in the two head compartments of the zinc-boxes is washed and the remainder moved up. The washing is done over the head compartment, and all precipitate is screened through a 30-mesh wire screen. The precipitate is allowed to settle and the solution is pumped by a 5 by 6 in. Knowles triplex pump through two Johnson filter-presses provided with 24 by 24 in. frames and leaves covered with 10 oz. duck. The settled precipitate in the zinc-box is bailed into tubs and dried in pans, without acid treatment, in a three-muffle drying furnace fired by coal. This precipitate, as well as that collected in the filter-presses, is thoroughly roasted, then pulverized and fluxed with 20 lb. borax, and 16 lb. bicarbonate of soda per 100 lb. precipitate. Formerly it was the custom to treat all the zinc-box product with sulphuric acid before filter-pressing; this practice required extra labor, expense, and time, and has been discontinued, as there was no appreciable increase in the fineness of the bullion produced.

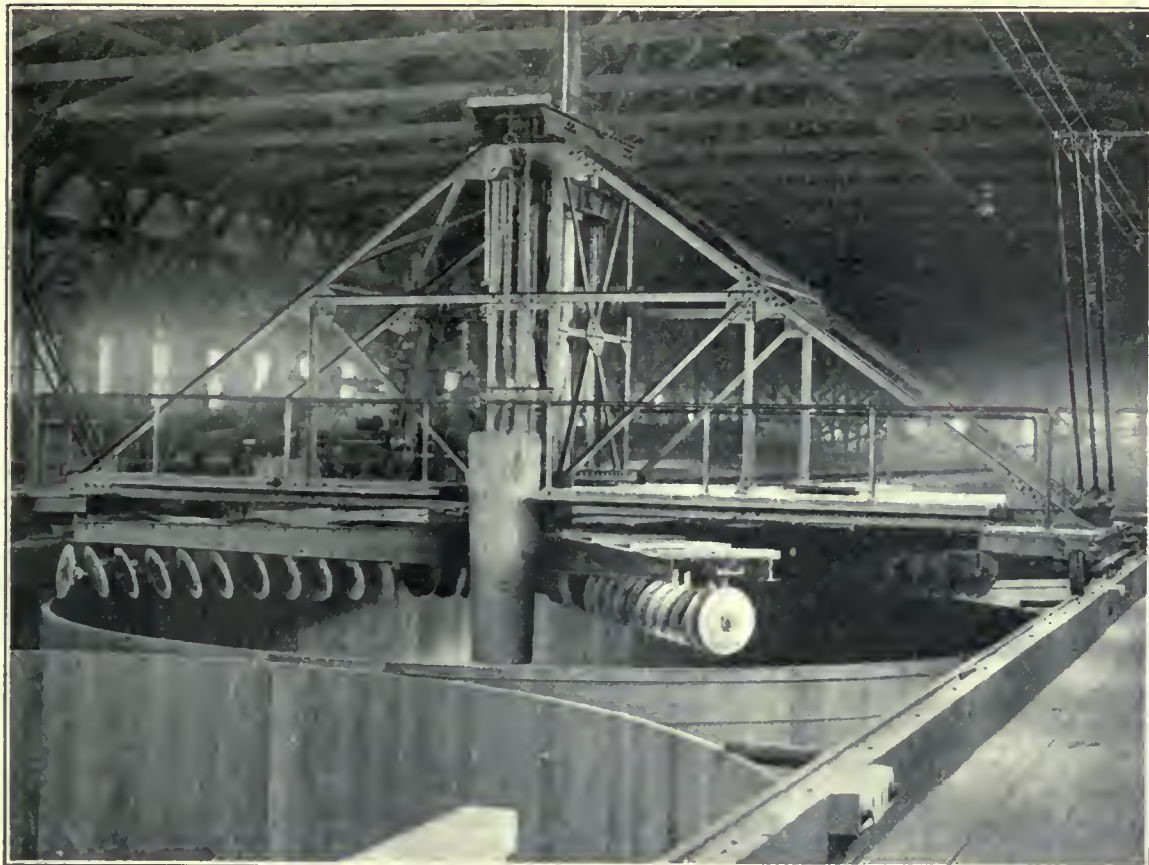
The melting is done in six Faber du Faur tilting fur-



Stamps and Wilfley Tables at the Desert Mill.



The Butters Filter in the Desert Mill.



Blaisdell Excavator in the Desert Mill.



Sumps and Extractor Boxes.

naces, equipped with graphite retorts, with a capacity of 80 lb. fluxed precipitate. Coke is used as fuel and the first pour is made six hours after starting fires. At the present time, 2,800 lb. dried precipitate is melted into bullion in 24 hr. from the time of firing the furnaces. After a charge has melted down, sufficient precipitate is added to make a bullion bar weighing about 1,200 oz. Troy. From 70,756 lb. roasted precipitate, 47,442 lb. bullion were produced; that is, without acid treatment, 67.05% of the precipitate went into bullion. This bullion had an average fineness of gold 13.5, silver 965, total 978.5 per thousand.

Pours are made directly into bullion-molds placed upon slag-pots. The molds have a slotted overflow for slag. This procedure does away with re-melting buttons into bars, made necessary when pours are made into slag-pots. The graphite retorts in the furnaces will last for about 18 fusions, when they are discarded and new ones inserted.

Owing to the fact that the crushing takes place in cyanide solution and that the sand and slime are in contact with the solution from the time they enter the batteries, it is impossible to secure trustworthy samples of sand and slime separately and keep a record of extraction by cyanide on each product. Accordingly, the difference between the gross content of the ore and the gold and silver in the concentrate shipped, is taken as the gold and silver contents going to the cyanide plant. The extraction by cyanide is estimated from this by comparing with the total ounces of gold and silver shipped as bullion and refinery by-products, with the total contents in sand and slime residues as a check. The extraction by cyanidation from March 1 to August 1, 1907, figured in this manner, is 86.06% of the gold and 80.14% of the silver contents. Combining this with the extraction by concentration, as above, 15.63% of the gold and 30.32% of the silver, gives a total extraction by concentration and cyanidation of 88.24% of the gold and 86.20% of the silver in the ore.

The average consumption of chemicals per ton of ore, for the last five months, has been: Potassium cyanide, 3.24 lb.; lime, 7.20 lb.; lead acetate, 0.38 lb.; zinc shaving, 1.10 lb.; zinc shaving consumed per ton of solution precipitated, 0.32 pounds.

Changes and improvements in the plant now under way, such as increasing the concentration equipment by better classification, increasing the Butters filter capacity and improving the present slime agitation equipment, will increase the percentage of extraction and decrease the cost of operations.

BRAZILIAN QUARTZ CRYSTALS.—There has been considerable variation in the foreign demand for crystals of quartz of large size for optical work found in Brazil during the past few years and apparently the trade is not growing. The exports of all such crystals from Brazil in 1904 was about \$16,103. In 1905 it went up to a total of \$18,132, but in 1906 it fell to a total of \$10,553. Much of this fluctuation is due to the variation in the supply. There is a vast difference in the quality of the stones found and the trade varies accordingly. Most of the best stones seem to exist in a sort of circuit ranging from the central portion of Sao Paulo through Goyaz and the western portion of the State of Minas. There is a considerable supply of smaller stones and stones of inferior quality to be had in the Rio de Janeiro market at almost any time. The best stones generally are obtained by placing orders in advance. The price given as the average for exports last year was about 42c. per kilo. (2½ lb.) but this means little in view of the great variety of stones.

Use of the Divining Rod.

Numerous devices are used throughout this country for detecting the presence of underground water—devices ranging in complexity from the forked branch of witch-hazel, peach, or other wood, to more or less elaborate mechanical or electrical contrivances. Many of the operators of these devices, especially those that use the home-cut forked branch, are perfectly honest in the belief that the working of the rod is influenced by agencies—usually regarded as electric currents following underground streams of water—that are entirely independent of their own bodies, and many people have implicit faith in their ability to locate underground water in this way.

In experiments with a rod of this type, one of the geologists of the United States Geological Survey found that at points it turned downward independently of his will, but more complete tests showed that the down-turning resulted from slight and—until watched for—unconscious changes in the inclination of his body, the effects of which were communicated through the arms and wrists to the rod. No movement of the rod from causes outside the body could be detected, and it soon became obvious that the view held by other men of science is correct—that the operation of the 'divining rod' is generally due to unconscious movements of the body or of the muscles of the hand. The experiments made show that these movements happen most frequently at places where the operator's experience has led him to believe that water may be found. The uselessness of the divining rod is indicated by the facts that the rod may be worked at will by the operator, that he fails to detect strong currents of water running in tunnels and other channels that afford no surface indications of water, and that his locations in limestone regions where water flows in well-defined channels are rarely more successful than those dependent on mere guesses. In fact, its operators are successful only in regions in which ground water occurs in a definite sheet in porous material or in more or less clayey deposits, such as the pebbly clay or till in which, although a few failures occur, wells would get water anywhere.

Ground water occurs under certain definite conditions, and as in humid regions a stream may be predicted wherever a valley is known, so one familiar with rocks and ground water conditions may predict places where ground water can be found. No appliance, either electrical or mechanical, has yet been successfully used for detecting water in places where plain common sense or mere guessing would not have shown its presence just as well. The only advantage of employing a 'water-witch,' as the operator of the divining rod is sometimes called, is that skilled services are obtained, most men so employed being keener and better observers of the occurrence and movements of ground water than the average person.

MINING LICENSES IN INDIA.—The Government of British India has decided to limit the areas granted by district officers under alluvial prospecting licenses to 1,600 acres, measuring not more than 5 miles in length except in cases of narrow belts of river gravel, on which extraordinary concessions may be granted to a length of 10 miles. The Government purposes, before the expiration of the newly granted licenses, to revise the existing general rules that govern the granting of prospecting licenses and mining leases in British India, and members of the mining community interested in the matter are invited to send to the Geological Survey department suggestions which they think should be considered before the revision is undertaken.

Mining in Australia.

Written for the MINING AND SCIENTIFIC PRESS
By W. J. LORING.

Unquestionably, never before have mining operations in Australia been conducted so extensively as today. As time goes on the miniature booms peculiar to every mining country are followed by their sequel of ups and downs in the lives of various camps. Certainly the present high price of metals is responsible to a large extent for the widespread activity, and a low metal market invariably spells corresponding periods of depression in the mining field. The following short digest is written with the intention of bettering the average American's acquaintance with Australia. The States comprising the Commonwealth will be dealt with seriatim:

QUEENSLAND.—While important mining operations

treat the copper-gold ore. Mt. Morgan is about 24 miles west of Rockhampton and is connected by railway with that town. The copper-gold industry should see great strides within the next few years in this State, particularly if the copper market holds anywhere near the present price. New copper mines are being opened up every week. The Great Fitzroy gold and copper mine is one of the most recent, and from present appearances promises to become a big producer. This mine is situated 17 miles northeast of Rockhampton. The ore bears a remarkable resemblance to that of Mt. Morgan, although the two mines are separated by some 40 miles and are not even on the same general course of country. Many promising districts throughout the northern part of the State are crying for active development, but the great drawback is the lack of railroad communication, which obviously is one of the important elements in opening and developing the existing large low-grade orebodies. The Government appears to be fully awake to the impor-



Eastern Australia.



tance of this point and is lending every aid within its power to provide transportation facilities.

NEW SOUTH WALES.—Broken Hill is the most active centre in the whole State, although there are some other lively mining camps. Over 10,000 men are employed at Broken Hill, which supports a township of about 40,000 inhabitants. About 100,000 tons of ore are treated monthly at the Broken Hill mines, producing silver, lead, and zinc. The ore shows a tendency to carry a higher percentage of zinc in the lower levels than was the case in the shallower workings, and this zinc content will very much increase the value of these mines. Broken Hill is now the largest mining camp in the Commonwealth and each half-year sees a bigger yield. Good railroad facilities are available, and everything is in favor of this centre retaining its importance and present prosperity for many years. The Great Cobar copper-gold mines are steady producers and are an important factor in the mineral output of the State. Copper can be found everywhere in New South Wales, and in some places the prospects for future lucrative mining are most favorable. Under the category of gold mining, the Mt. Boppy must be given pride of place as a steady producer and regular dividend-payer. New South Wales is also a good producer of tin, most of which is won from the northern portion of the State close to the Queensland border. The enormous deposits of excellent coal stretching from

have been carried on in this State for many years at Gympie and Charters Towers, where the mines have been worked to a great depth principally for gold, the industry has had more attention for the past couple of years than ever before in its history. Cloncurry and its environs have received special attention, and as soon as railroad facilities are established the output from this district should be an important item in the mineral wealth of Australia. The Mt. Morgan mine possesses one of the biggest copper-gold deposits in the world. It is a wonderful property, having started its career as a gold mine of enormous size and turning to copper-gold in depth, but still maintaining its huge dimensions down to the lowest level opened up. Some idea of its size may be gauged from the fact that the production from the commencement of its career in 1886 amounts to £13,000,000, out of which over £7,000,000 have been distributed in dividends. Thousands of feet of diamond-drilling have been executed to prove the future of the property, with the result that the management know what they may expect for several years to come. The mine is equipped with a very fine plant for the treatment of oxidized gold ore, a separate works for sulphide gold ore, and a third installation to

Newcastle for a hundred miles along the coast are too widely known to call for more than a passing reference here.

VICTORIA.—The rich historic fields of Bendigo and Ballarat are about worked out, and although new mines will doubtless be found, nothing of any importance can be expected as the State has been well prospected. It is of interest to note that its career began about the same time that the California diggings were opened up. Victoria is the domicile of the 'deep leads,' which have already produced much wealth, and from all appearances will continue to do so for many years to come. There are hundreds of miles of these ancient rivers yet to be opened up. One of the most recent industries is the development of the dredging system for working low-grade and shallow alluvial deposits.

TASMANIA.—This little island is richly endowed with mineral wealth. The Mt. Lyell copper and gold mine alone has a monthly output of £80,000. In tin the State is especially rich, the Briseis representing the largest alluvial mine and the Mt. Bischoff the most valuable lode-tin proposition. It is worthy of note that the latter company, which commenced its career a generation ago, has never failed to return a monthly dividend to its fortunate shareholders, the distributions to date totaling over £2,100,000.

SOUTH AUSTRALIA.—Mining is not on any large scale in this State. The old Burra Burra copper mine, which had some sensational yields in the 'fifties and shut-down thirty years ago, is now being reopened. South Australia is entitled to sympathy for its bad luck in missing Broken Hill, which is situated only a few miles within the New South Wales border. Much benefit is reaped, however, by the State having the nearest sea-front and the only railroad connection with Broken Hill. South Australia hopes yet to be the Cinderella of the Australian family, and looks to the Northern Territory to keep it. The Governor-General and several members of the Federal Parliament have recently returned from a visit to this district and speak in glowing terms of its future. The drawback in the development of the Northern Territory is its inaccessibility, or rather distance from civilization. Bordering also on the equator, the 'White Australia' policy will not make the labor problem an easy one, and such will probably always prove the fly in the ointment.

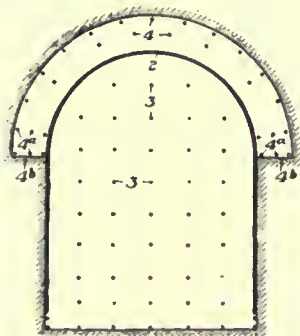
WESTERN AUSTRALIA.—The wonderful goldfields of this State, discovered in the early 'nineties by the pioneer prospectors, created a boom which was felt, not only in Australia, but throughout the whole world. While it is said that every ounce of gold produced to date has cost much more than its value, it cannot but be admitted that the discovery of these fields has been of enormous benefit to Australia and the world generally. As a rule, people do not invest money in mining unless they can well afford it, and therefore take a chance on what should be a legitimate undertaking. The wealthy investor, who can well afford to take a chance, represents the major portion of the capital required for such ventures as characterized the advent into W. A. of the proverbial 'stony-broke' prospector, the latter, in many instances, being the only one who benefited by the transaction. If the benefit was one-sided in an inverse sense, perhaps more good would result, from the fact that the capitalist would reap his reward and the prospector gain sufficient pecuniary recompense from the sale of his claim to enable him to plod on his way in search of another bonanza, in fulfillment of that innate desire possessed by every true prospector of becoming his own boss and winning a fortune from mother earth.

What could be a more legitimate way of circulating a portion of the rich man's money than to first assist and pay the prospector for his property, thereby presenting him with the means of seeking and developing new fields? The mines of W. A. have been opened up on practically these lines, and while John Bull has reaped a large benefit in many instances, he needs praise for the enormous financial assistance rendered to the State. For many years English capital was dumped into W. A. to prospect and search for new mines, but this has dwindled to slight proportions, with the effect that those small mines that counted on this support for many years have had to close down, throwing out of employment a large number of men and considerably affecting the output of gold. During the time that these changes transpired the richer and more prosperous mines had become steady producers and had perfected their surface equipment and mastered the extraction problem, which at one time was a most serious question. Their organizations were also modeled, and, on the whole, the system in vogue at present in this State sets a standard which is the envy of many mining fields outside Australia. It should be remembered that the West Australian goldfield was the most recent discovery up to a couple of years ago, when the rich fields of Nevada were found, and therefore West Australia had the advantage of avoiding, to a certain extent, the mistakes of other and older fields. The enormous richness of the region besides attracting the attention of capitalists permitted the payment of high wages, which proved a magnet in drawing the best class of workmen from the other States, with a stimulating effect on mining operations. All of these elements have counted in providing West Australia with a stable industry, which is much stronger today than is generally realized. The advantages of improved methods and high-class labor have been the means of lengthening the lives of the mines by adding hundreds of thousands of tons of lower grade ore than could have been profitably worked had the old conditions prevailed, that is, high working costs and bad extraction. The fact of the gold yield being a diminishing quantity has caused the outcry that Western Australia is fast being worked out. It is only fair, however, to compare the present tonnage treated with that of six years or more ago. No great difference is discernible except in the grade of the ore, which fact has frightened investors considerably more than the facts warrant. The West Australian Government has stood loyally by the mining industry by providing railroads, telegraphic communication, and adequate water supplies. Much criticism is hurled at the Government, but principally by people who would be discontented in Heaven. There are times of course when the service is bad, but on its attention being directed to defects, the Government is invariably ready to rectify matters.

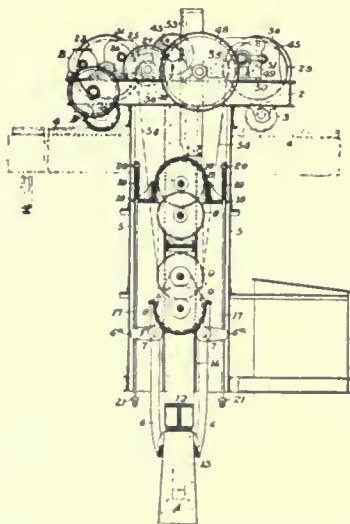
Of new fields, Black Range shows signs of being a good district. It is situated northeast of Geraldton about 325 miles, of which all but 100 miles can be covered by rail to Mt. Magnet, one of the mining towns of the early days. The Government has greatly assisted in the exploitation of Black Range by furnishing telegraphic facilities, and has now under consideration the extension of the railroad. The Great Boulder, Ivanhoe, Golden Horseshoe, Oroya Brownhill, Sons of Gwalia, and other large West Australian gold mines continue to open up satisfactorily, but space does not permit of individual description. Ravensthorpe, whose chief industry is copper-gold mining, is one of the fields receiving considerable attention just now. It is reported that some fairly good shows are under development and a strong English company is doing a lot of work, with, it is claimed, satisfactory results.

MINING AND METALLURGICAL PATENTS.

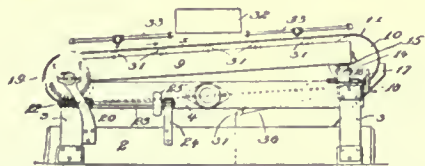
Specially Reported for the MINING AND SCIENTIFIC PRESS.

METHOD OF TUNNELING.—No. 867,392; David Maxwell, Detroit, Michigan.

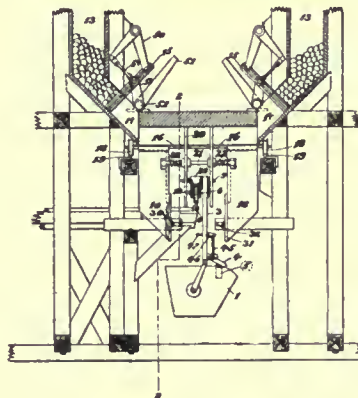
The herein described method of tunneling, which consists in preliminarily cutting or drilling to outline the cross-section of the tunnel, and also drilling exteriorly of such cross-section at the top of the tunnel, and subsequently dislodging and removing the material contained in the outlined area and in the exteriorly drilled area; substantially as described.

INGOT-STRIPPING MECHANISM.—No. 867,311; George W. Shem and Homer W. Israel, Alliance, Ohio.

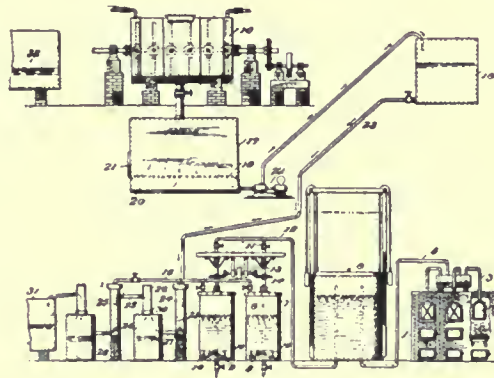
An ingot-stripper, a mold-engaging device, a carrier therefor, an ingot stop, a carrier therefor, sheaves supported by the carriers, a single continuous rope or cable having its intermediate portion engaged with the sheaves on both carriers, and a winding means for at least one end portion of the rope or cable; substantially as described.

ORE-CONCENTRATOR.—No. 867,267; Abel Guionneau, Denver, Colorado.

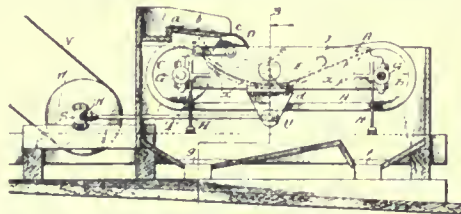
In an apparatus of the class described, an endless traveling transversely vibratory belt upwardly inclined from one end toward the other and adapted to discharge mineral values from each end, the belt having transversely-disposed riffles on the outer side thereof of progressively decreasing thickness from the back toward the front thereof, a feed-box at the back of the belt between the ends thereof, and wash-water pipes extending longitudinally of the feed-box, said belt serving on its vibratory movement to discharge mineral values from the front thereof.

AERIAL TRAMWAY.—No. 867,497; Walter S. Gemmer and Emil J. Schleicher, St. Louis, Missouri.

In an aerial tramway system, the combination of a traveling bucket and a traveling loader, said loader embodying a plurality of hoppers which discharge into said bucket.

ORE-SEPARATOR.—No. 867,360; John A. Haralson, Mexico, Mexico.

Apparatus for preprecipitating metals from solutions, the same comprising a retort for generating gas, a gasometer for storing the gas as produced, a generator containing water and the material previously retorted, means for supplying gas from the retort to the generator and agitating the solution therein, a mixer, means for supplying metalliferous solution and the gas from the generator to the mixer in regulable quantity, and a separator receiving the metalliferous solution impregnated with the gas from the mixer to effect separation of the metal by preprecipitation.

SCREEN SIZING AND SEPARATING MACHINERY.—No. 864,827; John M. Callow, Salt Lake City, Utah.

In screen sizing apparatus, the combination of a frame, a water tank thereon, an endless traveling band of screen cloth, means for supporting it at its ends above such tank, intermediate means for deflecting the working portion of the band below the level of the supporting means and into the water, and means for imparting a reciprocating motion to the frame.

ELECTRIC FURNACE PROCESS OF MAKING LOW-CARBON METALS OR ALLOYS.—No. 858,780; Frederick M. Becket, Niagara Falls, N. Y., assignor to Electro Metallurgical Co., a Corporation of West Virginia.

The process of producing low-carbon metals or alloys, which consists in smelting the charge by an electric current of high density, carried by a carbon electrode of relatively small sectional area, and cooling said electrode throughout a considerable portion of its length.

Publications Received.

'Bibliography of the Geology of Connecticut.' By H. E. Gregory. Bulletin No. 8. State Geological Survey.

'Report on the Bell Mount and Middlesex District.' By W. H. Twelvetees. Government Geologist of Tasmania.

'Chemical Reagents, Their Purity and Tests.' By E. Merck. A 250-page book, devoted to the description of reagents and methods for determining the exact degree of their purity. The D. Van Nostrand Co. Price, \$1.50 net.

'Quantitative Punctuation.' An essay in the pedagogy of English composition. By J. D. Logan. This is a suggestive and practical brochure on punctuation. Any writer will be glad to read it and to possess it. Published by William Briggs, Toronto.

'Illinois State Geological Survey. Bulletin No. 4.' In this is given the statement of the progress for the year 1906, preliminary investigation of Illinois fire clays, contributions to the study of coal, a report of the stratigraphical work near East St. Louis, and mineral statistics for Illinois for the year 1906.

We are in receipt of the following publications of the United States Geological Survey: 'Bulletin No. 304; Oil and Gas Fields of Greene County, Pennsylvania.' By Ralph W. Stone and Frederick G. Clapp. 'Bulletin No. 311; The Green Schists and Associated Granites and Porphyries of Rhode Island.' By Benjamin K. Emerson and Joseph H. Perry. 'Bulletin No. 317; Preliminary Report on the Santa Maria Oil District, Santa Barbara County, California.' By Ralph Arnold and Robert Anderson. 'Bulletin No. 318; Geology of Oil and Gas Fields in Steubenville, Burgettstown, and Claysville Quadrangles, Ohio, West Virginia, and Pennsylvania.' By W. T. Griswold and M. J. Munn. 'Bulletin No. 320; The Downtown District of Leadville, Colorado.' By Samuel Franklin Emmons and John Duer Irving. 'Professional Paper No. 53; Geology and Water Resources of the Bighorn Basin, Wyoming.' By Cassius A. Fisher.

We have received the following advance chapters from the Mineral Resources of the United States for 1906: 'The Cement Industry,' by Edwin C. Eckel; 'Gypsum and Gypsum Products,' by Ernest F. Burchard; 'The Production of Precious Stones,' by Douglas B. Sterrett; 'Asbestos,' by J. S. Diller; 'Mica,' by Douglas B. Sterrett; 'Phosphate Rock and Phosphorus,' by Myron L. Fuller and George W. Stone; 'Asphalt and Bituminous Rock,' by Joseph A. Taff; 'Quartz (Flint) and Feldspar,' by Edson S. Bastin; 'Monacite and Zircon,' by Douglas B. Sterrett; 'Anthracite Coal,' by William W. Reiley; 'Fluorspar and Cryolite,' by Ernest F. Burchard; 'Barytes,' with a note on 'Strontium,' by Ernest F. Burchard; 'Bauxite and Aluminum,' by Ernest F. Burchard; 'The Production of Nickel, Cobalt, Tungsten, Vanadium, Molybdenum, Titanium, Uranium, and Tantalum in 1906,' by Frank L. Hess. In this are given not only the statistics concerning these metals but also a statement of the experiments and investigations of these metals during the year. 'The Production of Mineral Waters in 1906,' by Samuel Sanford. In this are given statistics of the sale of such waters, the trade conditions in that industry, and the locality of the important mineral springs of each State. 'Water Supply and Irrigation Paper No. 198. 'Water Resources of Kennebec River Basin, Maine,' by H. K. Barrows, with a section on the 'Quality of Kennebec River Water,' by George C. Whipple. In this is an interesting chapter on water pollution with especial reference to the transportation of typhoid germs in surface waters.

STEEL FOR MANCHURIA.—A steamship sailed from New York recently with a 12,000-ton cargo of steel equipment for the Manchurian railroad, furnished chiefly by the United States Steel Corporation. Within the next 12 months 163,000 tons of rails, 8,000 tons of bridges, 250 locomotives, and 3,000 cars will be shipped to Dalny, the principal seaport terminus of the South Manchurian system.

Catalogues Received.

THE PACIFIC TANK CO. issues a little folder describing the Hampton improved zinc lathe No. 3.

THE CYCLONE DRILL CO., of Orrville, Ohio, is sending out an attractive folder entitled 'Cyclone Blast Hole Drills and Loaders.'

SAM'L K. BEHREND, 1711 California St., Denver, Colo., manufacturer of the Behrend dry concentrator, has issued a useful description of that machine.

THE H. W. JOHNS-MANVILLE CO. of New York has issued a folder called Catalogue No. 110, on 'Morris Metallic Packing,' for which this company is the sole selling agent.

THE ARTHUR KOPPEL CO., of Pittsburg, has issued Catalogue No. 227 on 'Portable and Industrial Railways.' It illustrates the simplicity and usefulness of the Koppel system.

THE BROWN HOISTING MACHINERY CO., of Cleveland, Ohio, has just issued an attractive circular dealing entirely with ore-handling locomotive cranes, which should interest mining men.

THE HOSKINS CO., of Chicago, is sending out a preliminary announcement of the 'Hoskins Electric Furnaces.' This is a new departure and further announcements will follow.

THE JEFFREY MANUFACTURING CO., of Columbus, Ohio, has issued Catalogue No. 69 A., entitled 'Jeffrey Screens,' and contains illustrations of every type of screen manufactured by this company.

THE ALLIS-CHALMERS CO. has just issued Instruction Book No. 5010. In this are given full and explicit instructions for installing and operating Allis-Chalmers 'Direct Current Motors and Generators, type H, H I, and I.'

THE FORT WAYNE ELECTRIC WORKS, of Indiana, sends us Instruction Book No. 3,028 on Type K single-phase integrating induction wattmeters; also Bulletin No. 1,098, on Type M P L belted generators for light and power, and Bulletin No. 1,100, on small direct-current motors, Type L.

THE J. GEO. LEYNER ENGINEERING CO., of Denver and Littleton, Colo., has issued a catalogue describing their ore handling apparatus; also Bulletin No. 512, and Bulletin No. 510. The first mentioned covers cars, skips, buckets, cages, tanks, derricks, sheet-iron work, etc. Bulletin No. 512 treats of the Model No. 6 Water Leyner rock-drill; No. 510 contains 56 pages on steam and electric hoists, giving horsepower, size of wire rope to use in hoisting, and size of electric wire used on their machines. Each one of these catalogues is complete in itself and will be sent on application.

Commercial Paragraphs.

THE DURYEA MANUFACTURING CO. of New York, has recently made an agency agreement with Barton Squires & Byrne, 531 Howard St., San Francisco.

THE WM. POWELL CO. announce that the increasing demand for their steam engineering specialties has compelled them to enlarge their plant by an addition of 200 horsepower.

THE ROBINS CONVEYING BELT CO. will, on October 1, remove their main office from the Park Row Bdg., New York, to Passaic, N. J. At Passaic they have recently constructed a modern office building adjacent to their works. This move is necessitated on account of the large business they are doing, which calls for more commodious quarters than were available in New York.

THE POWER & MINING MACHINERY CO., of Cudahy, Wisconsin, announces that, owing to the increase of business on the Pacific Coast, it has opened an office at 148-150 First St., San Francisco, where it will carry a full line of mining machinery and supplies. E. C. Hutchinson, at one time with the Union Iron Works, and recently at the head of the mining machinery department of the Charles C. Moore Co., will be in charge.

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TABLE OF CONTENTS

Editorial:	Page.
Notes.....	505
The Stock Market.....	506
The Barnes King Affair.....	506
Dredging at Dawson.....	507
General Mining News.....	509
Special Correspondence.....	514
Bulte, Montana	Cripple Creek, Colorado
Mexico City	Toronto, Canada
Salt Lake, Utah	Denver, Colorado
Nogales, Arizona	
Concentrates.....	520
Discussion:	
Deep Thinking.....	Joseph Daniels 521
Fast Sinking.....	P. S. Williams 521
The Curiosities of Mining.....	Mark R. Lamb 521
Professional Customs.....	
	Forbes Rickard, H. W. Turner 521
Articles:	
The Mt. Morgan Mine.....	524
Tantalum.....	525
The Copper Situation.....	James Douglas 526
The Charging of Blast-Furnaces.....	F. H. Messiler 528
Arrangement for Dumping Buckets.....	H. N. Herrick 533
Vanadium in the United States.....	534
A Centrifugal Roller Quartz Mill with Central Feed.....	536
Mining and Metallurgical Patents.....	535
The Prospector.....	534
Decisions Relating to Mining.....	532
Departments:	
Personal.....	506
Market Reports.....	506
Commercial Paragraphs.....	536
Catalogues Received.....	536

Editorial.

GOVERNOR HUGHES of New York has dared to deny the right of the owner of 51 per cent of the stock of a corporation to do what he pleases in the management of its affairs, and he has even ventured to add that the policy of such a majority must be "consistent with good faith and fair dealing to all." We are glad to see such an expression of opinion. It is high time that the control of a majority of the stock, or proxies from a subservient minority added to the small holdings of an unscrupulous financier, should cease to carry with it the right to loot. Directors are trustees, not licensed looters.

WE TAKE PLEASURE in quoting at length on another page from an article by Mr. James Douglas on 'The Copper Situation,' appearing in the current number of *The Engineering Magazine*. It is not necessary to emphasize the position held by Mr. Douglas in the copper industry nor to tell our readers that anything he says is worth listening to. In his summary of the present status of the copper mining industry he has made clear the basic facts and given a large amount of information of particular interest at this time.

IN RECENT CORRESPONDENCE from the Cœur d'Alene region, reference has been made to the suits between Mr. Jonathan Bourne Jr. and the Sierra Nevada Consolidated Company, now pending in the District Court at Wallace. The general impression is that this is a controversy between the Bunker Hill & Sullivan Company and the Federal Company. It is well therefore to state that the Bunker Hill & Sullivan Company is in no way connected with this litigation, Senator Bourne having been the owner of the ground in question for nearly twenty years, and the case is being conducted in his own behalf and at his own expense. It happens that Mr. Stanley A. Easton has acted as advisory engineer to Senator Bourne, and Mr. F. A. Folsom, one of the attorneys of the Bunker Hill & Sullivan Company, is also attorney for the Senator. From this coincidence the idea has grown that the big mine at Wardner is involved in the particular litigation mentioned. The misunderstanding is worth correction.

NEW YORK papers, even the best of them, exhibit impatience with the Presidents' speeches and vent their displeasure in satirical comment. They object to being "harangued" by Mr. Roosevelt and they marvel at the enthusiasm with which great audiences greet him. As we happen to live far from Wall Street and State Street, and from the stock speculation that makes men dependent upon the doings of a few restless financiers, we do *not* marvel at the influence exerted by the President and the interest taken in his utterances. Mr. Roosevelt

makes some blunders, like any other impulsive man, and he plays politics, as do most leaders of a party, but the American people delight in the evident sincerity of his purpose, the frankness of his speech, and the forcefulness of his attitude on matters that need all of these qualities. There are other men of equally strong fine character in this country, otherwise it were in a bad way indeed, but it so happens that none of them are in a position to make themselves such a living power for good as the President. His popularity may suffer, especially among those to whom his antagonism to predatory finance seems more radical than safe. His speeches may be frequent and too minatory. But assuredly the American people will continue to thank him for rallying all that is best in this Commonwealth to the defence of laws too long outraged and to the support of civic ideals too long smothered by rampant individualism.

The Stock Market.

THE SPECULATIVE CRISIS of the past week will have proved a matter of concern even to those least affected by the gambling operations on Wall Street and State Street, for when the dust created by falling pyramids has cleared the financial arena will be strewn with the wrecks of ruined lives, and that is sad enough, however amusing the vagaries of the plungers may have been. The plight of Heinze and his friends will provoke no more sorrow than surprise, for he has ever been an unscrupulous gambler, no worse than many others and more picturesque than most, but still an evil influence in the mining industry. Moreover, he is young and not easily daunted, so he has a future. We hope it will be more reputable than his past. But one of the real captains of industry whose name is on everyone's lips today is George Westinghouse. Without any special knowledge of Mr. Westinghouse, we have every reason to regard him as one of the few mechanical and financial geniuses that have not prostituted great talents to financial piracy. He is honored as a man and respected as the leader in tremendous industrial activities. He belongs to the best type of clever, self-reliant, progressive Americans, and we regret that financial embarrassment should have resulted to him at this time. Another name is mentioned as that of a financier likely to be compelled to retire from an autocratic position. We refer to E. H. Harriman. It would be a splendid tribute to the strength of public opinion if this grand larcenist were forced to resign from the trusteeships that he has dishonored. No worse influence exists in American life today than the unscrupulous jobber who is at the head of several great railroad systems. Such men as Harriman, Rogers, Ryan, and the traction looters of Philadelphia and New York represent the most vicious development in industrial civilization. The sooner they are recognized at their true worth, the better for representative government in America. If the tumble in stock quotations leads to the elimination of some of these undesirables, it will be well.

No heed should be given to those who attribute the débâcle to the speeches of the President. Mr. Roosevelt's

outspoken criticism has been directed against dishonest practices, and it has coincided with a period of reaction. A coincidence is magnified to a consequence. By reference to the quotations current in October 1904, we find that some of the leading stocks stood at that time as follows: Amalgamated, 62; American Smelting, 65; Union Pacific, 104; United States Steel preferred, 77; Calumet & Hecla, 550; Wolverine, 96; United Copper, 5 to 8. Compare these figures with the prices of this week and it will be found that they stand on a close parity with those of three years ago, which means that the crash of the past ten days has been due mainly to the expulsion of aerated warm water. It has not been caused by legislative or inquisitorial action at Washington or elsewhere. A period of excessive speculation has come to an end, a few reckless gamblers are ruined and in their wreckage they have pulled down much better men, including many innocent and ignorant investors. In the meanwhile the country is all right and the industrial development of it will continue, despite the betting on stocks. A few gentlemen who were carried forward on the crest of a great wave of prosperity had begun to think that they made the wave. They are now like the seaweed that is left by the receding tide, which ebbs and flows, but does not disappear.

The Barnes King Affair.

OUR CORRESPONDENT at Butte has referred to this fiasco in his recent letter. Many features of the affair are difficult to understand; but one of them we can make clear. Among the professional men mentioned as having reported favorably on this much over-rated mine is Mr. Walter H. Weed, one of the foremost geologists in America. We wrote to him asking him to state in what way he was connected with the flotation. His telegraphic reply arrived after we had gone to press last week, therefore we are glad to give his answer the fullest publicity possible by publishing it herewith. His telegram says: "I have never made examination for, nor had any connection with, Barnes King mine or promoters thereof; I made a preliminary geological examination without measurement or sampling for some private clients, who thereafter declined option; and neither report nor any part thereof has been given out. Have never even visited the Clipper group or that district. The use of my name in either connection is wholly unwarranted and libelous." It is a great pleasure to be able to do this measure of justice to an honorable man, especially as some of our contemporaries have gone astray. *The Mining World*, a Chicago periodical, says, very truly, that "all that glitters is not gold" and then adds, most wisely, that this is another example of "frenzied finance." In assuming Mr. Weed to be blameworthy, the Chicago paper refers to its "editorial correspondence;" this is misleading, for that so-called "editorial" correspondence will be found in our issue of October 12, only there it has been edited, while in *The Mining World* it is given verbatim as sent to us from Butte by our regular correspondent. However, that is by the way. The Barnes King is now in

good hands, namely, those of Messrs. John Gillie and C. W. Goodale. They will protect the bewildered stockholders. It is odd that such men as John D. Ryan, John Gillie, and C. W. Goodale should have gone into an enterprise that turned out such a fraud and it is presumable that they were misled by the report of an engineer formerly in the employ of the Amalgamated. If, in addition to their recent service to the stockholders, they will state frankly how they themselves were deceived, it is likely that the fiasco may serve at least as a warning to the public, both lay and professional.

In the meanwhile we may point out that this is not the first time that geological investigations have been dragged into the vortex of a flotation. Several of the officers of the United States Geological Survey have found their scientific descriptions of mineral areas used as frills to decorate the masquerade of financial chicanery and they have been powerless to prevent such injury to their reputations. In such cases it is well to explain the matter frankly to their friends and this they can do most effectively in the pages of the engineering periodicals. A man whose reputation is clear in the eyes of his own profession, need not bother about the public. That blundering entity must get its rating of engineers and geologists from their peers, that is, from the members of their own profession.

Dredging at Dawson.

WE ARE INFORMED that the placer mining operations of the Guggenheims at Dawson have been stopped, owing to the financial stringency at New York. Although not much has been said about the matter, it is understood that the Guggenheims have expended about \$7,000,000 in the purchase of alluvial ground near Dawson, and that they have taken up practically all of Bonanza creek, including the bench gravels of the so-called White Channel. Some of the lower ground will be worked by dredges, while the higher benches will be hydraulicked, it being expected that the natural thaw will permit of this method of mining. For the last two years the Guggenheims have been engaged in construction work on a large scale, including a ditch 53 miles long, with two siphons, to bring 5,000 inches of water from Twelve Mile creek. An electric plant has been erected, and the dredges will be operated by it. During the past season three dredges have been at work and the material for four more is on the ground or partially assembled. It is also stated that the same financial group has bought the control of the White Pass railroad, which connects Dawson with the coast at Skagway.

It remains a moot question among engineers as to what extent frozen ground can be worked profitably, despite the undoubted high content of the gravel in that part of the Yukon, for an average yield of a dollar, or even more, is not at all unusual. Dredging is still an experiment under Arctic conditions, but the outlook is promising. The first dredge in that part of Alaska was one of the New Zealand type, which was erected in 1898 on the Lewes river in the Yukon. Subsequently it was taken apart and removed to Dawson, and placed on the Discov-

ery claim, where it proved most successful. Then the Rothschilds of Detroit built a dredge at the mouth of Bear creek. This installation cost \$300,000; it was operated by electricity and it proved a distinct success, the yield being fully \$1 per yard. It was a Marion steam-shovel, and was erected in the short space of 51 days. The daily capacity was 3,500 cubic yards. The success of this plant called attention to the district for dredging purposes, and led to the incursion of the Guggenheims, with the results stated above.

If the frozen ground can be worked successfully, there will be a tremendous lot of gold taken out within the next few years. Of course, frozen ground cannot be blasted. Anyone who has tried will know why. Then steam points were introduced for thawing. They consist of a hollow pipe of 1½ inch diameter and 20 feet long, making way for a ¾ inch pipe, through which the steam is led. But this method is costly, and in working on a large scale, it is expected to make the most use possible of the natural thaw. When the muck and moss that covers the surface are removed, the thawing will proceed at the rate of six to ten inches per day, on a vertical face, such as that of the bench gravels. It is said that on a sunny exposure the seasonal thaw will amount to as much as 15 feet, but even this may not be sufficient to reach the bedrock, on which most of the gold lies. In the creeks, the thaw may extend to the water-level, but there it stops, for the water being just below the freezing point, creates an obstacle to further melting of the ice binding the deeper gravel. However, these are problems new in placer mining, and we hope that the next year or two will yield much valuable experience, some of which we expect to record in these columns.

REENFORCED CONCRETE is being used on an enormous scale in the rebuilding of San Francisco. Apart from the variety of reenforcement used, and the quality of the cement, it is not too much to say that the excellence of the work performed differs to a degree not altogether pleasant to contemplate. Rigid inspection is hardly to be expected, and municipal control of construction is not yet sufficiently advanced to make inspection altogether reliable. The best inspector is Mr. Earthquake, whom you cannot bribe, and who is not in politics nor in a labor-union. On April 18 of unpleasant memory he found several defects in the buildings of the city; it were well to be always ready for such casual inspection as he may make without formal notice. In the meanwhile the following note may prove suggestive to those engaged in the work of reconstruction: In cement the two principal substances of definite composition are alite and celite. The former exists as well defined crystals, the latter as a matrix or interstitial filling. When excess of 'gage-water' is used and the cement is allowed to stand, alite separates out on the surface, which is weaker than the mixture of alite and celite; hence in the use of cement where excessive gage-water is used, if a period elapses between two successive pourings sufficient to admit of final set, the newly added cement bonds upon a line of weakness.

Personal.

H. V. WINCHELL has been to Bisbee.
 MARTIN J. HELLER is at Cripple Creek.
 THOS. T. READ is here, on his way to China.
 ALBERT BURCH is at Virginia City, Nevada.
 L. C. WYNNE is at Hedley, British Columbia.
 COURTENAY DE KALB has returned to Los Angeles.
 E. A. LONG, of Ouray, Colorado, is in San Francisco.
 R. C. N. TWITE has returned to London from the Caucasus.

DUDLEY BAIRD has returned to San Francisco from Spokane.

ROSS B. HOFFMAN has returned to San Francisco from Alaska.

D. C. BARD, of Butte, has been on a visit to Salmon City, Idaho.

SAMUEL NEWHOUSE has been called to New York from Salt Lake.

C. D. KAEDING has returned from Korea and is in San Francisco.

C. T. DURELL sailed on the *Manchuria* on his way to the Philippines.

VICTOR G. HILLS has returned to Denver from Guanajuato, Mexico.

C. W. MERRILL is visiting his home in Alameda, near San Francisco.

FRANK H. PROBERT has returned to Los Angeles from a holiday in Europe.

RICHARD B. STANFORD is at Colorado Springs, on his return from Nicaragua.

ROBERT SIBLEY, of Spokane, is at Oroville studying methods of gold dredging.

E. L. BALLOU has left Pony, Montana, and is at Igo, in Shasta county, California.

B. N. LEHMAN, of the Yankee Con. mine at Tintic, is in Siskiyou county, California.

J. A. HOPPER has returned to San Francisco after several months holiday in England.

J. C. RALSTON, of Spokane, who has been seriously ill, is convalescing satisfactorily.

ARTHUR D. YOUNG is making a survey of the Green Gold-Silver Co.'s concession in Sonora, Mexico.

C. C. WILSON has opened an office at 22 Second St., San Francisco, to engage in general engineering practice.

DUNCAN MACVICHIE, managing director of the Bingham Consolidated and other Heinze enterprises, has gone to New York.

R. J. HAWKE, formerly with the El Progreso Mining Co. at Triunfo, Lower California, is now superintendent of the El Cobre mines of the Douglas Copper Company.

FRANK BAIRD, smelter superintendent for the Penn Copper Co., at Campo Seco, is convalescing at his home in Berkeley from a serious injury received while operating a slag-train.

R. H. SUTTON, superintendent of the Cocopah Copper Co., who has been spending the past month at Los Angeles, has returned to the mines at Ivanpah, San Bernardino county, California.

J. B. TYRRELL, who for the past eighteen months has been mining engineer for Mackenzie, Mann & Co., owners of the Canadian Northern railway, is now prepared to do a general consulting business. His office is still at 9 Toronto St., Toronto.

A. L. McCARTY, until recently general superintendent for the Comanche M. & S. Co., at Silver City, N. M., J. W. CROWDUS, superintendent for Eckles & Co., at Chloride Flats, N. M., and chief engineer to the Comanche Co., and E. P. McCARTY, assistant professor of mining engineering in the University of Minnesota, have opened offices as engineers at El Paso and Minneapolis.

Latest Market Reports.

LOCAL METAL PRICES—Oct. 24.

Antimony.....	13@17c	Quicksilver (flask).....	\$45@45.50
Copper.....	No market	Spelter.....	7@ 7.75c
Pig Lead.....	4.85@ 5.80c	Tin.....	60½c

ANGLO-AMERICAN SHARES.

Cabled from London.

	Oct. 16.	Oct. 23.
£. s. d.	£. s. d.	£. s. d.
Camp Bird.....	0 18 3	0 18 0
El Oro.....	1 4 6	1 3 9
Esperanza.....	1 18 9	1 18 0
Dolores.....	1 2 6	1 2 6
Oroville Dredging.....	0 14 6	0 14 9
Stratton's Independence.....	" "	0 3 0
Tomboy.....	1 7 6	1 6 3

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.

Date	Electrolytic Copper	Lead	Spelter	Silver
Oct. 11.....	13½	4¾	5.48	63¼
" 12.....	13½	4¾	5.48	62¾
" 13.....	Sunday.	No market.		
" 14.....	13½	4¾	5.48	60¾
" 15.....	13½	4¾	5.48	61¼
" 16.....	12¾	4¾	5.48	61¼
" 17.....	12¾	4¾	5.48	60¾
" 18.....	12½	4¾	5.48	60
" 19.....	12½	4¾	5.48	60
" 20.....	Sunday.	No market.		
" 21.....	12¼	4¾	5.48	61½
" 22.....	12½	4¾	5.48	61½
" 23.....	11¾	4¾	5.48	61¾
" 24.....	11¾	4¾	5.48	61¾

MINING STOCK QUOTATIONS—NEW YORK.

Closing Prices.

	Oct. 16.	Oct. 23.
Bingham Central.....	½	½
Boston Copper.....	11¾	10¾
Cumberland Ely.....	4½	4½
Dolores.....	5¾	5½
El Rayo.....	2¼	2
Guanajuato Con.....	2½	2
Giroux Con.....	3¾	3
Greene Cananea.....	12	5½
Nevada Con.....	7¾	6¼
Nipissing.....	5½	5½
Tennessee Copper.....	23	19
Tonopah Ex.....	1¾	1½
Tonopah-Belmont.....	1¾	1
Tonopah.....	8½	8
United Copper.....	16	8
Utah Copper.....	16	13

(By courtesy of Hayden, Stone & Co., 25 Broad St., New York.)

COPPER SHARES—BOSTON.

Closing prices.

Closing prices.

	Oct. 21.		Oct. 24.
Adventure.....	1	Michigan.....	7
Ahmeek.....	40	Mohawk.....	
Allouez.....	19	Nevada Con.....	6½
A amalgamated.....	44½	North Butte.....	
Arcadian.....	2¾	Old Dominion.....	18¼
Atlantic.....	7½	Osceola.....	74½
Balaklala.....	3½	Parrot.....	8½
Bingham Con.....	5¼	Phoenix.....	30
Boston Con.....	10	Quincy.....	70
Butte Coalition.....	11½	Raven.....	75
Calumet & Arizona.....	90¾	Rhode Island.....	2
Calumet & Hecla.....	540	Santa Fe.....	
Centennial.....	16	Shannon.....	
Con. Mercur.....		Superior & Pittsburg.....	7½
Copper Range.....	45¼	Tamarack.....	50
Daly-West.....	9½	Trinity.....	11
Franklin.....	6½	United Copper com.....	7
Granby.....	60	Utah Copper.....	11
Greene-Cananea, etc.....	5½	Victoria.....	3¾
Isle Royale.....	12¾	Winona.....	2¾
Mass.....	22½	Wolverine.....	93

(By courtesy of E. F. Hutton & Co., 490 California St.)

SOUTHERN NEVADA STOCKS.

San Francisco, Oct. 24.

Atlanta.....	\$ 22	Laguna.....	85
Belmont.....	85	Manhattan Con.....	35
Columbia Mtn.....	17	Midway.....	49
Combination Fraction.....	85	Mizpah Extension.....	10
Daisy.....	51	Mohawk.....	11.00
Fairview Eagle.....	65	Montana Tonopah.....	1.60
Florence.....	2.30	Nevada Hills.....	3.75
Gold Bar (Bullfrog).....	38	Red Top.....	2.25
Goldfield Con.....	4.60	Sandstorm.....	15
Goldfield of Nevada.....	1.20	Silver Pick.....	25
Gold Kewanas.....	21	St. Ives.....	35
Great Bend.....	26	Tonopah Extension.....	1.57
Jim Butler.....	31	Tonopah of Nevada.....	7.62
Jumbo.....	2.25	Tramp Con.....	17
Jumbo Extension.....	55	West End.....	38

(By courtesy of W. C. Ralston, 368 Bush St.)

General Mining News.

ARIZONA.

GRAHAM COUNTY.

The wagon-road to the Bacon & Landerman claims, near Morenci, has been finished and shipments to the Shannon and the Douglas smelters have been resumed. The development work on the claims is so encouraging that Bacon & Landerman have bought several adjoining claims.—The recent strike at the Buzzard Shadow is still looking well.—Considerable development work is being done on several groups of claims near Copper creek: these ores carry copper and gold. The development has already reached the sulphide ore below the surface carbonates.

MOHAVE COUNTY.

Another strike of rich galena has been made on the De la Fontaine mine at Stockton Hill. The vein is three feet wide.—The White & Howell roaster at the Vanderbilt mill is almost completed. The mill will start as soon as the roaster is finished.—The mill at the Oro Plata is about finished; some of the machinery, which was shipped six weeks ago from Chicago, has not arrived as yet, and so the starting of the mill is delayed.—The Pyramid mine and mill has been shut-down until heavier machinery, which is to be driven by electricity, can be installed. This mine has been a very large gold producer.—The shaft at the P. K. mine, in I X L basin, is being sunk deeper. The ore in it looks better than that in the upper cross-cut.—Owing to the wash-out of the water-line from Little Meadows to Goldroad and the inability to get oil for power, the Gold Road Co. has been forced to close down the mill. A large electric compressor has been ordered for the mine. A tube-mill is to be installed and the mill enlarged during this shut-down.

YUMA COUNTY.

The Boone copper mine in Cunningham Pass, near Wendendale, has been sold to Nevada mine operators. This property was discovered in 1863 by Cunningham, the old pioneer after whom Cunningham Pass was named. The shaft on the property is down to water-level and the recent purchasers have been shipping ore for several months.—The King of Arizona M. Co., operating about 45 miles from Mohawk, is working 150 men at present, while 50 men are hauling freight and wood. The shaft at the mine is 750 ft. deep, being sunk at an angle of 65°. The main tunnel, which gives 250-ft. backs, is 200 ft. long. The mill is supplied with water from two bored wells 1,100 ft. deep. The ore is crushed dry in breakers and rolls and then cyanided without amalgamation.

CALIFORNIA.

HUTTE COUNTY.

The wagon road from Oroville to the Cape Horn drift mine is about half finished. Work is being pushed at the mine where the recently found channel is being developed. W. M. Wilson is manager.—The union recently organized by the dredger men has a membership of over 150 men. It is reported that the winchmen will ask for \$3.50 per day and the oilers for \$3, this being a raise of 50c. per day. No formal demands have been made as yet; the dredging companies say that they can not afford to pay any such increase in wages.

EL DORADO COUNTY.

The Green Valley Mining Co. is preparing to work the placer gravels on the Dormody ranch above Folsom. A contract has been let for the erection of a \$10,000 plant. A new method will be used in mining this deposit. Pumps will be used to create pressure for the hydraulics, which will work in pits from which the gravel is elevated to the sluices; these sluices will be placed so as to return the tailings to the ground which has been already washed. This mine will probably be working about the first of next year.—The old Atlantic mine near Placerville is being sampled.—The Lovless brothers have found another body of ore in their mine near El Dorado. This mine produced \$20,000 from the ore-shoot which was found several years ago.—The shaft

at the Poundout gravel mine is down 80 ft. and will reach the channel at a depth of about 50 ft. more.

KERN COUNTY.

A telluride ore has been found on the 500-ft. level of the Sunshine mine at Randsburg. The ore is of high-grade and there appears to be considerable of it.

NEVADA COUNTY.

(Special Correspondence).—It is rumored that the Idaho-Maryland will resume operations at an early date.—Sinking is rapidly progressing at the Central Shaft, good progress being made.—The shaft at the Kenosha is being rapidly unwatered, and it is thought that active operations will commence in a few days. The ore from this property will be handled at the California mill, pending the installation of a plant by the Kenosha Co.—The rich strike recently made in the Gold Mound is holding out well, and the vein is giving good indications of permanency.—The vein at the Conlan has narrowed to a small stringer, and considerable driving is under way, in hopes of striking a larger and richer orebody. A 10-stamp mill was recently installed at the mine.—Rich ore is being taken from the shaft of the Aurora mine at Randolph Flat, and much active development is under way.—Development is progressing steadily at the Union Hill mine, and the management is well pleased with the showing thus far made.—At the Pennsylvania-W. Y. O. D. mine some good ore is being developed. Operations are being carried on principally through the W. Y. O. D. workings. Bennet Opie is superintendent.—At the Champion-Home mine, at Nevada City, splendid ore is being taken from the lower levels, and the 70-stamp mill is running constantly on good ore. The rich vein recently struck on the 300-ft. level in the Champion is showing up splendidly, and large quantities of rich quartz are being extracted. The Home shaft has reached the 800-ft. level, and a large area of virgin territory is being developed.—The vein recently struck in the Austin mine in Willow Valley is improving with development. The mine was recently inspected by W. S. Beard, F. Meyn, and William Rose, Kansas City, Mo., capitalists, who are interested in the property.—Active operations will commence at the Phoenix mine at Gold Flat in the course of a few days.—W. P. Martin, superintendent of the Gold Flat mine, has struck a rich shoot of ore in his lease on the Golden Gate. A large force of men will be put to work to thoroughly develop the vein, while a pumping and hoisting plant will be installed.

Grass Valley, Oct. 21.

Work has begun at the Nevada County Midas Co. property on Randolph Flat. The new shaft will be sunk at an angle of 60° near the old shaft; it is to be 10 ft. 5 in. by 5 ft. 5 in. in the clear. A payment on the adjoining Davis property has been made by this company. The Aurora, Dolly Madison, Kenosha, Gold Mound, and California mines are all on the same mineral zone as the Midas. The old Baltic mine has been bonded by G. W. Root, general manager of the Kenosha, and work has begun there in the hope of tracing the Midas lode into that claim.—At Meadow Lake the Union and the Excelsior Con., locally known as the Hartley properties, have been sold to the Excelsior Consolidated Mining Co.—A large body of gold-bearing quartzite has been found in Fairview mine, near Relief hill.—The Golden Gate mine at Grass Valley has been reopened, and some good ore has been found.—A good surface showing of galena has been found on some claims in the southern part of this county. This is the first vein of galena found in Nevada county.

PLUMAS COUNTY.

(Special Correspondence).—A strike of gravel running \$400 per ton is reported from the main tunnel in the Bellevue. Considerable work is under way.—At the Claybank considerable prospecting is under way in an endeavor to find the main channel. J. M. Thomas is superintendent.—A 7-ft. vein of excellent ore has been struck in Tunnel No. 3, at the Copper Hill. The mine is one of the properties of the Con. Copper-Gold Co.—Good ore has been encountered in the upper levels of the Five Bears,

and the mine is showing up well. Development has exposed several promising shoots of ore.—A 7-ft. vein of ore assaying \$500 per ton has been struck in the main tunnel at the Plumas National mine, seven miles from Greenville. The tunnel is in 1,500 ft. and the vein has been proved several hundred feet. Large quantities of high-grade copper ore are being developed in the Eagle mine, in the Genesee district. The main tunnel is in 200 ft. with 600-ft. backs. Several veins near the surface are being developed. John and William Huesmon are developing several claims, which adjoin the Eagle. Ore carrying gold, silver, and copper, which assays from \$10 to \$34 per ton is being taken from shoots near the surface. Prospect shafts have been sunk and the ore is also exposed by cuts.—The Plumas-Mohawk Co. is developing a group of rich gold claims near Johnsville. A mill with a capacity of 200 tons per day is being erected; this will be operated by water power.—Rich ore is coming from the Jamison mine, and extensive development is under way.—At the White Lily six stamps are dropping on good ore.—At the Gruss mine rich ore is being taken from the upper levels, and the 5-stamp mill is running full time. Since its discovery the Gruss has produced about \$500,000 from numerous gopher holes. The Feather River Placer M. Co. is driving a tunnel on the Scott claim to intersect the Sunnyside and Dutch Hill channels.—Nevada capitalists have had the Hilda and adjoining properties examined by engineers and it is expected that the properties will change hands shortly.—Several companies are preparing to operate extensively on Poorman's creek during the coming winter. Nevada corporations are particularly active. Reno people have acquired control of most of the leading gold and copper properties throughout the Genesee, Last Chance, and Ward Creek districts.

Quincy, Oct. 17.

SHASTA COUNTY.

The vein in the Midas mine at Harrison Gulch has been recovered in new ground on the 1,100-ft. level; the vein is said to be of good grade. About 35 men are working at the mine but the force is to be increased soon.—Owing to the low cost of copper, all the large copper mines and the smelters of Shasta county have shut down. This throws 1,000 men out of work and stops a monthly payroll of \$125,000. Among the mines that have shut down are the Shasta King, the Trinity, the Balaklala, and the Mammoth, but in addition many quartz mines of this and Trinity county, which have been furnishing fluxing ore to the smelters, will also have to close down.

SIERRA COUNTY.

The first clean-up at the new 5-stamp mill at the Papoose mine in Jim Crow canyon near Downieville was quite satisfactory; about 200 tons were crushed during the run.

TRINITY COUNTY.

The Globe and the Chloride gold mines near Weaverville have been sold to W. H. Pinkston for \$150,000. Richard James has been appointed superintendent. The two mines will be worked jointly. Formerly it has been impossible to work the Globe into the winter owing to heavy snow fall, but the Chloride mine on the south side of Globe Mtn. can be worked all the year. It is intended to work the Globe through the Chloride mine and so keep both in operation the whole year. The Chloride mine was a large producer several years ago, but the ore petered out. The mine then employed 100 to 150 men and the 20-stamp mill and cyanide plant was kept busy. Eight or ten men have been kept on development since and considerable ore has been opened up. The vein at the Globe mine is about 12 ft. wide and is of good grade.—A 9-ft. vein of ore has been found on the 110-ft. level of the Gold Standard mine, 14 miles west of Carville.—The Sykes mines at Trinity Center is employing 20 men; T. McDonald is superintendent. The ditches and flumes are being repaired and everything put in readiness for hydraulicking this winter. The dredger which has been working at Trinity Center for the past few years is being dismantled and a larger and stronger one will be built. Clary & Payne, the owners, are working some gravel in the sluices; the gravel is hoisted from a shaft

which they have sunk in the gravel near the river.—The mill at the Bonanza King mine is being run full time but not at its full capacity; 65 men are employed at the mine and mill.

TUOLUMNE COUNTY.

Wages have been raised voluntarily by the owners of the Mack mine, near Groveland. Muckers will receive \$3 per day; single jackers, \$3.25; machine men, \$3.50; all miners work eight-hour shifts.

COLORADO.

SAN JUAN COUNTY.

The Frisco Mines & Tunnel Co. is driving the Bagley tunnel to tap the old Red Cloud workings and other well-known veins in the vicinity. The tunnel is now 3,850 ft. in length; they have about 1,200 ft. farther to drive before reaching the Red Cloud. When the tunnel is completed through the mountain it will extend into Ouray county. They are using Ingersoll Sluggers, also Leyner No. 6 drills and the Waugh drills. They recently cut three blind veins but have developed them but little. One of the veins is considered to be of workable grade but the other two have not been developed sufficiently to state how good they are. A Franklin compressor has been recently installed. The railroad is surveyed to the tunnel entrance, which is about three-fourths of a mile from the terminus at Animas Forks. O. B. Clarke, superintendent; N. R. Bagley, manager, and D. R. Reed, consulting engineer.—The California Mtn. Mining Co. is driving an adit into California mountain; about 400 ft. farther ought to cut the Mountain Queen vein, the objective point. The adit is now over 1,400 ft. in length. Ingersoll drills and a Rand compressor are used in doing the work. A. H. Kunkle is superintendent.—The big Gold Prince mill is operating 70 stamps at present, but within a short time expects to be running full capacity. The mill contains 100 stamps, 70 Card concentrating tables, and 5 tube-mills. The machinery was supplied by the Denver Engineering Works of Denver. M. O'Rourke, superintendent of the mill, has made some minor changes in the past few months, but the mill remains practically the same as designed. Spitzkasten have been added, one below each tube-mill. Each spitzkasten supplies 10 tables with pulp from the tube-mill. At present the mill is handling 200 tons through 24-mesh screen and later on will handle 500 tons per day through 16-mesh screen, the ore being re-ground in the tube-mills. The mill is constructed of steel and concrete throughout and is considered one of the finest mills in the county and is a credit to the manufacturers. It is situated at Animas Forks on the line of the Silverton & Northern Ry. at an altitude of 11,300 ft.—about timber line. The mine is 1,000 ft. higher and the ore is carried to the mill by an aerial tramway, Bleichert type, two miles in length. W. Z. Kinney is general superintendent of the mine and mill.

NEVADA.

CHURCHILL COUNTY.

At the Nevada Wonder, the Brock property, the shaft is 500 ft. deep, and they have started a cross-cut for the vein at that depth. Three veins have been developed in the upper levels, one of them being 50 ft. wide where it was cross-cut.—At the Hidden Treasure the cross-cut on the 160-ft. level has passed through 50 ft. of vein matter and as yet the other wall has not been found.—Last week the Jack Pot made a shipment of 25 tons which is said to average over \$200 per ton.—The shaft on the Dickey V. is still only 100 ft. deep, but the cross-cut on the 100-ft. level is 65 ft. long and has just cut the vein.

ESMERALDA COUNTY.

(Special Correspondence).—The mines are looking better than ever before, and in spite of the car shortages and other troubles, the output is nearly \$400,000 per week. Building operations are in full swing and there are no labor troubles to retard the early completion of several fine stone and brick business blocks.—The richest ore-shoot, considering its size, ever opened in a Goldfield mine is now being mined in the Little Florence lease. This orebody, which was found on the 400 level, is five feet wide and will average \$1,000 per

ton. The ore is principally quartz containing yellow seams of gold, together with black sulphides. The new 500-ft. shaft will be finished in a few days and will greatly facilitate hoisting. At present the ore is brought up through a very inconvenient inclined shaft. The lease runs until Feb. 8, 1908, and has already paid four dividends of \$100,000 each. The 500-ft. shaft is being sunk in record time and will be completed in less than 40 days. Work is being carried on at four different points in the shaft and is under the superintendence of A. H. Warner, a Columbia graduate.—The Consolidated Mines Co. is shipping 10 cars per day, and after the present car shortage this number will be increased. The ore runs from \$50 to \$800 per ton and, with the daily output of about 400 tons, brings the total to over \$1,000,000 per month.

The work is being gradually concentrated at the Mohawk shaft; men are being dismissed at the adjoining Consolidated properties and added to the force in the Mohawk.—An important discovery at a depth of over 300 ft. was made lately on the Victor property, showing a four-

Under the above condition of affairs the lessees are working with renewed efforts, and are piling on their dumps quantities of rich milling ore, while many of the lessees on the various properties are also taking out shipping ore along with the milling ore.—On the 350-ft. level of the Thanksgiving property the same high-grade ore has been encountered as found on the upper levels. Operations have been suspended for a few days, awaiting the arrival of a station-pump to handle the water.—Messrs. Cole & Burns have secured a lease on the entire surface of the Little Gray claim, and will work the dirt by sluicing. Water will be obtained from the Gold Wedge shaft. Considerable placer mining is being done throughout the Manhattan district. On the Indian Camp claim several sets of lessees are at work, all obtaining good results from dry placering. The surface dirt runs from \$1.00 to \$10.00 per cubic yard. Wilcox & Golish have taken a lease on the company shaft of the Indian Camp, and will develop the veins which have been traced through the company's property.—On the Jumping Jack claim, in addition to the placer diggings, Kendall & Douglass are extracting high-grade ore from the 50-ft. level in their lease. About 12 in. of the vein on which they are working will assay between \$300 and \$400 per ton in gold; considerable good milling ore is also being taken out.—On the Stray Dog Mr. Giffin is mining some high-grade along with the milling ore. Dan McNamara recently secured a lease on the Stray Dog, and was sacking ore within a week from the signing of it. In the early days of the camp the Stray Dog became well known on account of the specimen ore taken out by the lessees.—On the Wolfstone Extension galena has been found in considerable quantity at a depth of 50 ft.; the formation is identical to that of the Thanksgiving and Bryfogle. The Wolfstone Extension people believe that they will develop rich ore-shoots similar to those of their neighbor, the Thanksgiving.—No less than half a dozen sets of lessees on Litigation Hill are sacking high-grade ore. Specimen ore is a feature of Litigation Hill, some of the finest specimens ever seen in the State having been taken from this ground, which is a portion of the Dexter Mining Company.

Manhattan, Oct. 15.

(Special Correspondence).—Hydraulic mining has commenced on the ground of the Combination mine by the Round Mountain Hydraulic M. Co. Two giants are in position, and a large area of rich ground is being treated.—The Round Mountain Combination Co. has commenced active development at its group, which includes the Hobo Fraction, White Horse, and Blue Jay No. 2. An incline shaft will be sunk at a point between the east line of the Sunnyside and the Kinney lease. When a depth of 100 ft. has been reached, driving will be started.—The Solid Gold Co. has struck a four-foot vein of rich ore in the new shaft on the Daisy. The ore assays from \$40 to \$500 per ton, and was struck at a depth of 36 ft. The strike is said to be one of the most important made in the camp.—The Crescent lease on the Daisy is driving for the vein. The shaft is down 125 ft., but the vein has not yet been encountered. A hoist has been erected by the lessees.—Several companies have applied for leases on the Combination ground. The Combination is controlled by the Ish brothers of Goldfield.—Rich ore is being extracted from the shaft at the Antelope, and extensive developments are under way.—Some of the richest ore ever found in the camp is being taken from the shaft of the Sunnyside. Development is opening up a rich body of ore.—The Daisy Co. owns the principal water rights in the district and will supply local mills and power plants.—Round Mountain is enjoying considerable prosperity, and does not seem to be affected by the depression in the stock markets. Close corporations control several of the leading mines in the district. The principal operators are the Round Mountain, Combination, and Daisy.

Round Mountain, Oct. 15.

(Special Correspondence).—The past month has been one of marked activity in the Bullfrog district. The Shoshone mill began operations last week and 150 tons are now being crushed daily, which represents one-third the capacity of the plant. Besides this 1,000 tons were shipped to the Salt



Map of the New Mining Districts of Nevada and California.

foot vein of ore giving assays of over \$60 per ton. This is considered an important find, as it proves that in that locality ore exists at depth and it will extend considerably the area for legitimate prospecting at Goldfield. The Victor was owned by the Goldfield Combination before that company was absorbed by the Consolidated. The rails of the Las Vegas & Tonopah R. R. have been laid as far as Columbia and in a few days will be in Goldfield. Oct. 28 has been selected as 'Railroad Day,' and a mammoth celebration is being planned by the city.

Goldfield, Oct. 16.

NYE COUNTY.

(Special Correspondence).—That the mining camp of Manhattan has taken on renewed life and activity is evinced by the increased traffic to and from the town and by the activity displayed in mining operations throughout the district. Manhattan is not primarily a high-grade camp; she depends upon ores of good milling grade for her future. The absence of mills and the San Francisco disaster were the cause of the deadness that followed the first boom; but now three mills are under course of construction in Manhattan. The Wolf mill will probably be running by Nov. 1; its capacity is 100 tons per day. Within 60 days the Lemmon 10-stamp mill will be in operation, to be soon followed by the 50-ton mill built by Davis & Chapman, which is equipped with Huntington mills.

Lake smelter during the month.—The Mayflower, management has given out a detailed statement of the showing on the fourth and fifth levels in that mine, and also future development plans. The orebody, which has been cut on each successive level, showed about 20% increase in value on the 400-ft. level, where it has been cross-cut for over 20 ft. without finding the other wall. In driving for the vein on the 500-ft. level, the first water in the mine was met. The flow increased rapidly until at present some 10,000 gal. are being hoisted daily by bucket. A Knowles Duplex station pump has been purchased and will be installed at once. The drift on the 500-ft. level has just entered the vein, showing that the ore, which has heretofore been oxidized, has changed to a sulphide at water-level. Now that the water question has been solved, the 50-ton mill designed by the Traylor Engineering Co. of New York will be erected, in which the ore will be amalgamated, concentrated, and then cyanided.—A recent 23-ton shipment from the National Bank mine gave an average return of \$484 per ton. This mine is among the best milling propositions in the district, an immense amount of ore having been blocked out by the 7,000 ft. of development work that has been done upon the property.—The Phillips-Moesser lease on the Gibraltar is said to be paying well, as the lessees have sacked a number of tons averaging about \$100 per ton.—The 20-stamp mill of the Keane Wonder mine, over near Death Valley, commences operations this week. The mill is at a point considerably below the mine, the ore being conveyed thither by means of an aerial tram; the latter also furnishing power for the 10 by 16-in. Blake crusher.—The Gold Bar mill is in course of construction. Work at the mine has been suspended until the mill is finished; large quantities of ore are already blocked out. There is considerable talk in regard to building a custom mill at Rhyolite. One is badly needed and would undoubtedly prove a paying proposition, as there are a number of mines close to the town of Rhyolite which, although they have considerable ore, have not felt justified in commencing milling operations individually, principally because of a lack of water supply.

Rhyolite, Oct. 17.

WHITE PINE COUNTY.

The diamond-drill hole started from the 100-ft. level of the McDonald-Ely is down about 100 ft. The 400-ft. level is showing some improvement.—The old Cumberland group at Osceola will soon begin to send ore to the 5-stamp mill. The Lead King Co. has shipped a carload of ore carrying 70% lead. This was taken from a drift on the 50-ft. level.

OREGON.

JOSEPHINE COUNTY.

(Special Correspondence).—At present the Galice Creek district, in the western part of Josephine county, Oregon, is attracting considerable attention. For many years this district was famed for large placer mining operations; its hydraulic mines are still producing much gold. But recently large, and in some cases high-grade veins of quartz, have been discovered and are being developed. Until about a year ago, except in a few isolated cases, no attempt had been made to open up the extensive veins known to exist; the 'pocket hunters,' who roam the hills in search of surface bonanzas, would not 'waste' time on low-grade veins. One of the exceptions was the well-known Sugar Pine mine, which has produced considerable high-grade ore, but which is now closed because of the quantity of water found in the lower levels. Two well defined mineral belts cross the district in a general north and south direction. On the eastern border lies the Big Yank, a lode, or rather a mineral zone approximately 300 ft. wide that can be traced nearly 12 miles. The ore-shoots in it now developed carry gold, silver, and copper. The Alameda mine, on this belt, is now shipping copper ore to the Tacoma smelter for treatment and the company contemplates the early erection of a smelting plant to handle the output of their mine. On the western border of the district lies the Chieftain belt, which passes south into California. At the Strenuous Teddy mine the West Fork of Galice creek has cut this great belt to a depth of 2,500 ft. Here this mineral zone has a total width of nearly 900 ft. with porphyry on its hanging wall

and serpentine on its foot-wall. In this width are several veins of ribbon-quartz, sulphide, and telluride from 2 to 44 ft. wide. Recently C. H. Smith, of Gold Hill, took samples from 12 veins on the Strenuous Teddy; these samples gave returns ranging from \$2.65 to \$328 per ton. This mine, which was discovered last year, is now owned by James B. Nesbit of Galice, C. H. Farmer of Gold Hill, Josephus Kester of Jackson county, and E. C. Clanton of Grants Pass. The three gentlemen first named also own a number of adjoining claims, covering the outcrop of the Chieftain belt in that vicinity. This belt both to the north and the south has been generally staked because of the reputation that the Strenuous Teddy mine is giving it.—A blanket vein, which leaves the Chieftain belt where the latter crosses Galice creek, can be followed in an easterly direction for a mile. In places this vein has a width of 16 ft. and carries good values in gold; considerable development has been done on it at the Gold Plated mine.—The three miles of country rock between the Big Yank and the Chieftain belts is more or less intersected with veins, some of which are producing shipping ore. Among these are the Golden Wedge, the Sanders, and the Oriole mines, at which a large amount of work has been done during the past year. The Black Bear mine, owned by the Green Bros., and the Robertson group of free-gold properties on Rich Gulch, also have good orebodies opened up. An extension of the Oriole, now under bond to Mr. Doan of Los Angeles, is being developed and a vein of high-grade ore has recently been struck. Between the west and south forks of Galice creek the Cold Spring group, owned by John Reeves and now under bond to the Alameda company, is being developed. A wide vein carrying gold and copper has recently been discovered in this group.—Most of the gold-bearing ores of the Galice district are base, but some free-milling ore extends to considerable depth. In the Strenuous Teddy, Oriole, and Sugar Pine mines the richest ores are tellurides; calaverite and petzite occur in the Strenuous Teddy and sylvanite in the other two. Tungsten, molybdenum, and the platinum group of metals are also found in the district.

Gold Hill, Oct. 11.

WASHINGTON.

FERRY COUNTY.

(Special Correspondence).—The old rumor in regard to the building of a smelter, in which the Republic ore would be fluxed with the lead ore from the Cœur d'Alene, has again been revived.—Considerable ore has been shipped from the Pierre lake and the Orient districts in Stevens county during September. Work on the California mine, 10 miles southeast of Republic, was suspended about two years ago on account of the necessity of a new shaft and disagreement among the stockholders. The California group of claims is an extensive property, but no attempt has ever been made to develop more than the one pay-shoot, although there are several veins. The California mine has produced about \$100,000. Some Chicago people have bonded the property and have begun to reopen the mine. The ore formerly extracted contained gold, silver, copper, and lead and was the richest ever shipped out of the district, excepting that shipped from the Republic mine in the early days of the camp, which netted at the smelters over \$300 per ton. The annual stockholders' meeting of the company was held here a few days ago, when the old board of directors was re-elected.—J. C. Beidelman, metallurgist for The Amalgamated Republic Mines Co., has examined the Quilp, Pearl Consolidated, Trade Dollar, Ben Hur, North San Poil, Mountain Lion, Little Cove, and Black Tail mines and reports having seen more ore than he had expected. His company has acquired options on the first five named mines and the Republic also. He said that although he is fully confident of the success of his method, which follows with few modifications the accepted cyanide practice, he will not consent to begin with an experimental mill of over 50 tons daily capacity, which could be gradually added to when found adapted to the ores of the camp. Mr. Beidelman has left for New York and expects to return here after consulting with people in that city. If the mining companies interested in Republic camp will agree to his

proposition to start with a 50-ton mill, he says, the company that he represents is prepared to go ahead.
Republic, Oct. 16.

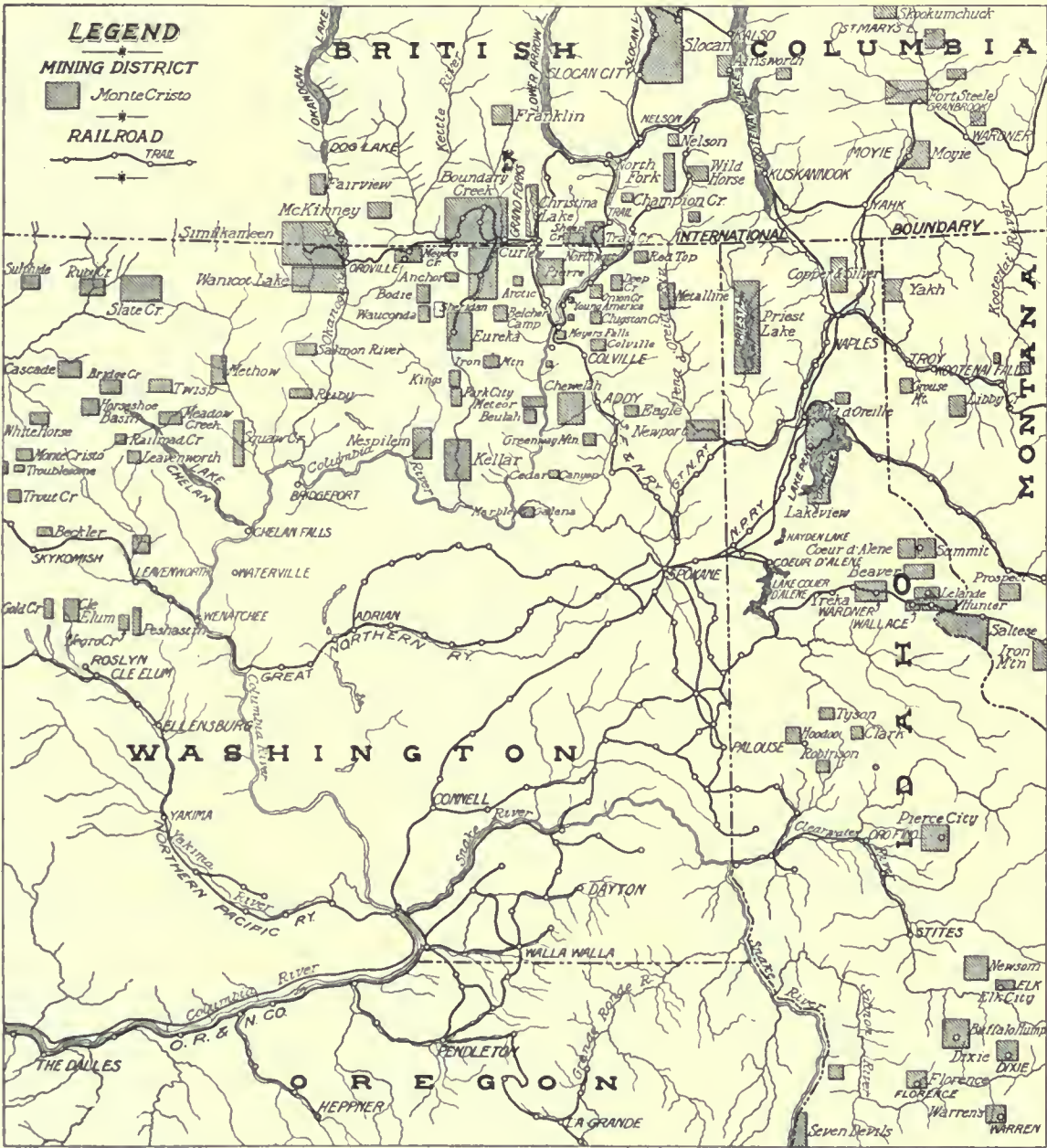
OKANOGAN COUNTY.

(Special Correspondence).—The Ruby mine on Mt. Chopaca is reported as looking well. Five hundred tons of ore are ready to be shipped as soon as the spur from Victoria, Vancouver & Eastern Railway is completed. The adit at the Nighthawk mine is in about 1,200 ft. The drills are driven by power from the Similkameen Falls power plant. Work at the Favorite mine has been suspended while a compressor plant and drill equipment are being installed.

is rumored that the Diamond Joe group has been optioned to one of the Boundary smelters. The amount of ore mined in the Boundary district was 35,500 tons during the week, one-half of it coming from the Granby mines.

ROSSLAND DISTRICT.

At the Idaho mine the shaft, which is 60 ft. deep, is in good ore; several ore-shoots have been uncovered by stripping. Considerable good ore has been found in the cross-cuts from the Centre Star which extend into the Idaho.—The development work at the Centre Star, Iron Mask, and War Eagle mines is adding considerable ore to the reserves. The shipments from the consolidated mines last week



The Mining Districts of the Boundary District and Northern Washington.

The Relste brothers have just sold their group of claims on Palmer Mtn. Some placer mining is being done along the Similkameen and Okanogan rivers, but the results of the work are not known. Construction is going ahead on the 300-ton stamp-mill and cyanide plant of the Palmer Mountain company.
Brewster, Oct. 2.

BRITISH COLUMBIA.
BOUNDARY DISTRICT.

The Granby smelter made a new record this week, as it treated over 3,000 tons of ore each day of last week. A new compressor is being installed at the War Eagle shaft and a compressor-house is being built. The Skylark Co. has started to prospect their property by means of boreholes. It

amounted to 3,740 tons, an increase of 500 tons since that of last week. The Le Roi shipped 1,610 tons—a decrease of 530 tons from last week.—The new find on the H vein of the Le Roi No. 2 is being developed with encouraging results.—The tunnel at the California mine is in 450 ft.; the shaft, which is being sunk from the tunnel level, is 50 ft. deep. A raise is being put up from the Giant tunnel in the orebody.

SIMILKAMEEN DISTRICT.

Last week a Chinaman found a \$57 nugget on Old Granite creek, where he had been working for some time. This find has caused some local excitement. The Independence mine on Bear creek, which is bonded to the Granby people, will work a force of seven men all winter. Supplies are being taken in.

Special Correspondence.

Butte, Montana.

The Heinze Failure.—Butte & London.—Pittsburgh & Montana.—The Barnes-King Fiasco.—A Salted Placer Mine.—Revival in the Homestake District.

The suspension of the State Savings bank in Butte, following the sensational slump in Davis Daly and United Copper stocks, gave a rather severe series of 'bumps' to the local followers of F. Augustus Heinze. Mr. Heinze owns 62% of the stock of the State Savings bank, and the suspension of the firm of Otto Heinze & Co. at New York precipitated the suspension of the State Savings bank, although, it is claimed, there was no connection between the two. The bank officials feared that the Heinze name associated with a failure would result in a run on the bank and the doors were closed. Not more than 20 depositors out of more than 6,000 were at the bank to withdraw their deposits. The bank carries more than \$3,000,000 in savings deposits, and the officials claim the bank is solvent. The State Examiner is in charge of the institution.

The Butte & London Co. has begun cross-cutting north and south from the 1,100-ft. station and expects to cut at least one vein within a month. H. V. Winchell, consulting engineer for the company, advised a change in the plans, which were to sink to a depth of 1,500 ft. before cross-cutting. Mr. Winchell is also consulting engineer for the Pittsburgh & Montana Co. and he has found that the richest orebodies in the mines of that company are on the 800-ft. level east of the cross-cut connecting the two Pittsmtont shafts. These orebodies lie southeast of the Butte & London shaft, and Mr. Winchell gave it as his opinion that the Butte & London is as likely to find ore at the depth of 1,100 ft. as at 1,500. The 15-ft. vein cut by the Boston & Montana in the Greenleaf shaft at a depth of 840 ft. strikes through Butte & London ground just south of the shaft and this vein is likely to be cut within a month. In the Greenleaf the vein carries good commercial ore. The Boston & Montana Co. will also cross-cut to the vein at a depth of 1,000 ft., the present depth of the Greenleaf shaft. The Butte & London will extend its cross-cuts through the greater portion of its extensive territory.

The Pittsburgh & Montana Co. expects to resume operations during the coming week. Mining has been suspended for more than a month because of the curtailment policy of the Amalgamated, which had purchased the ore of the Pittsburgh & Montana. The latter owns an experimental smelter, which was built by Ralph Bag-galey, former manager for the company, and this is being remodeled and fitted up as a modern smelter; when completed, it will be able to treat about 200 tons of ore per day. Before the shut-down the company was producing at the rate of about \$2,000,000 per annum.

E. E. Chase, of Denver, has been engaged during the past week in making an examination of the Barnes-King mines for Boston stockholders. The announcement by the New York men who floated the company that they, too, will have another examination made, does not arouse much hope or interest among stockholders in Montana, as it is remembered that the original reports on the property were made for this firm and for the purposes of flotation, through which, according to the reports of the present officials of the company, the stockholders have been swindled out of nearly \$2,000,000. Reno Sales, a geologist for the Amalgamated, has also been employed by the Barnes-King officials to make a geological exami-

nation. The new officials of the company have not yet been able to get from the former directors or promoters the original reports on the property nor a statement of accounts showing what became of the \$2,000,000 subscribed, though demands for them were made several weeks ago. The first president of the company, John C. Lalor, who is supposed to have had possession of some of the papers, has gone to Europe. Reports from disinterested persons in Fergus county now confirm the reports made by Messrs. Gillie and Goodale that there is very little ore in the mines. Senator Henry M. Rae, who is operating in the same district and is familiar with the Barnes-King mines, says that there is no doubt that the Gillie-Goodale report is correct and that there is not more than \$50,000 worth of ore in sight. However, he adds that there never was in the history of the mines any large amount of ore blocked out at any time. The ore lies in bunches and detached bodies, and new orebodies were repeatedly found, which, he believes, will be the case for a long time to come. There is an immense area of virgin ground to be prospected and there is always a possibility of encountering a rich orebody. It is growing more apparent as facts are investigated that the former directorate made a studied effort to deceive the public, and up to the time the property had been examined by Mr. Gillie lying reports were sent from the mine, even to the extent of misquoting Mr. Gillie. The ore actually in sight and blocked out was represented at different times by different reports from 5,000,000 down to 400,000 tons. Mr. Gillie found not more than 25,000 tons.

To a less extent, but in a more sensational manner than in the Barnes-King affair, another lot of Montana and Washington men have been swindled, with a loss of about \$300,000, through 'salted' placer mines in Wyoming. The Greenoughs are the principal losers. The property is known as the Red Canyon placer, and was taken over by the Greenoughs and associates for \$1,500,000 after exhaustive examinations and tests had been made, under the guidance of the men who are now suspected of having salted the ground. The reports were so good that the purchasers prepared to spend \$500,000 to bring a river through a mountain tunnel in order to get sufficient water to work the ground on a large scale. Chicago men offered the Greenoughs \$2,500,000 for the property and the offer was refused. E. W. King, one of the chief owners of the shell that was sold to the Barnes-King Co. for \$2,000,000 was offered an opportunity to take an interest in the Wyoming placer proposition, but his experience caused him to be wary and he became suspicious of the glowing reports, so he determined to make a personal examination. The result was that barely traces of gold were found where previous examiners found rich gravel. He reported to the Greenoughs and they then made another examination with the same results as King. It is estimated that no less than \$50,000 worth of gold was used in 'salting' the ground.

Activity in mining is being revived in the old Homestake district a short distance east of Butte on the line of the Northern Pacific railway. Years ago a number of gold properties were worked there, but none of them were ever extensively developed. The first returns were in many cases sensational, but the ore did not continue to any great depth. A number of Butte men have secured a bond and lease on a group of claims, including the Last Chance, Hillside, Gray Copper, Nickel Plate, and Mammoth. The life of the bond is 18 months and the price to be paid is \$50,000. Former operators did a lot of development work and uncovered a good showing on the Last Chance, but they lost the property by allowing the bond to lapse through a mistake. They are now threatening the owners and the new operators with liti-

gation. When they lost the property they had some good copper, silver, and gold-bearing ore.

Mexico City.

News From Guanajuato.—The River Scheme.—George Bryant's New Enterprise.—The Belt Railroad.—Sale of the Humboldt.—Activity at La Luz.

Since writing the letter which appeared in the MINING AND SCIENTIFIC PRESS of October 12, wherein I stated that George W. Bryant "has never been able to interest sufficient capital in his dredge scheme in the Guanajuato river to carry it through, and the enterprise has now been indefinitely laid aside." I have found that I was largely mistaken and that E. G. Spilsbury, who was one of the first that Mr. Bryant was able to interest in the river scheme, has for some time been engaged in washing the deposits in the Guanajuato river bed that have

estimated length of road of 79½ km., or about 50 miles; the location survey was to begin in three months, the first 10 km. completed in 15 months, and then 10 additional each year, with the entire road finished at the end of five years. Certain links in the line, between the company's own properties, have been completed, and September 15 of this year was celebrated by breaking ground on the main line, which was to be followed by a rapid completion of the whole, but now it is rumored that the general stringency in the money market will lead to a temporary cessation or curtailment of operations; it is to be hoped, however, that if such is true, it may not be for long, as this road will give transportation to many out-of-the-way properties and, next to the success of the cyanide process on Guanajuato ores, should prove the greatest impetus to the camp in recent years. In addition to the large properties of the Guanajuato Consolidated Mining & Milling Co., the Guanajuato



Map of Mexico.

been accumulating for centuries and that the returns have been far in advance of what was expected. The latest of Mr. Bryant's more important promotions is the Mexico Milling & Transportation Co., organized under the laws of New Jersey, with \$7,000,000 capital, of which \$2,000,000 were 6% preferred and \$5,000,000 common. The officers are George W. Bryant, president and general manager, J. J. Welch, vice-president, E. A. Wiltsee, consulting engineer, and F. G. Peck, treasurer, the stock having been placed by the Securities Corporation Co., Ltd., of 40 Wall St., New York. This company is controlled by the Guanajuato Development Co., which latter also owns the Pinguico mine, and has as its principal object, in addition to its two custom mills in successful operation in Guanajuato, the building of a standard-gauge belt-line to connect all the principal mines of Guanajuato district with the Mexican Central line at the station of Tepetate. The concession for this belt-line was obtained in August last authorizing the construction and exploitation of a railroad from Tepetate to Santa Rosa, for 99 years, touching at various mines, mills, etc., with a branch to La Luz and other camps, making a total

Reduction & Mines Co., and the Guanajuato Development Co., those of the Guanajuato Amalgamated Gold Mines Co. are proving to be valuable holdings and in addition to the ore from their mines a considerable tonnage from the old dumps is to be treated. El Cubo Mining & Milling Co. continues to be a steady producer. Next to the Pinguico, two shafts are being put down on the Humboldt, which was sold by Chas. Morse and E. J. Kimball to P. J. Nolan and associates for \$150,000, and though thought to be a pretty high price for a prospect, it was figured that the Carmen-Pinguico vein, which had been proved so rich, must enter the Humboldt on its strike as well as several other minor veins which seem to join the former on its way to the Humboldt, so that the property has every prospect of proving valuable. The Aparecida, next to the Sirena, is being developed by George W. Bryant, and he and others have taken over the La Luz and Bolanitos in the La Luz district, and it is said a \$2,000,000 company will be organized for their development and the erection of a large mill, as the past record of the properties assures profitable operations. The American Mining & Milling Co. has its

15 stamps and cyanide mill in operation and is treating 45 tons per day from its Siglo 20 and Inglesa mine. The Santa Maria and San Nicolas del Monte are taking a new lease on life, and the Edward VII gives promise of a bright future. On the Cabrastante, Dwight Furness, who has allowed the property to remain idle for some years, has interested Chicago people. The mine is being unwatered and is said to have some six feet of good ore in the main winze about 280 ft. below the tunnel-level. A cyanide mill will probably soon be needed. The Providencia Mining & Milling Co., at Tajo de Dolores, is putting in a complete electric equipment, which, with the new 60-stamp mill ordered, will call for about 600 horsepower.

Salt Lake, Utah.

Heinze's Affairs and the Ohio Copper Co.—Curtailment of Copper Production.—Shipment From Tintic.

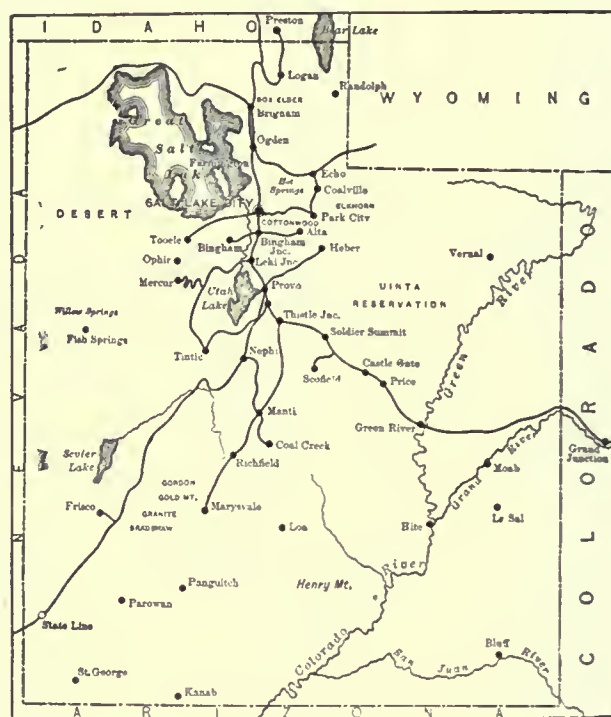
The collapse of the United Copper 'corner' on Wall Street and the apparent financial distress into which F. Augustus Heinze and some of his associates have fallen, has had its effect here in Salt Lake. It is not serious as yet, however, and it may be that the Heinze Utah enterprises will pull through without any hard knocks. Mr. Heinze is a controlling factor in the Ohio Copper Co. at Bingham, which has been carrying on a vigorous campaign of development during the present year and which has a new concentrating mill with a capacity for the treatment of 2,000 tons of ore daily nearing completion. The stock sold as low as \$2 per share during the week as a result of the disquieting news about Heinze's finances. This was followed by other reports to the effect that the Ohio company is not as well supplied with funds as many had been led to suppose and that unless Mr. Heinze managed to get out of his entanglements, the Ohio company might become temporarily embarrassed in carrying its plans into execution. Mr. Heinze has regarded the Ohio Copper mine as being one of the most valuable propositions at Bingham and his engineers, many months ago, mapped out a plan of development along broad lines. This included the extension of the Mascott tunnel of the Dalton & Lark mine into the property of the Ohio company and equipping it in a manner which, it is claimed, will enable the production of copper at not to exceed 6 cents per pound. The equipment of the Ohio was to be followed up by the erection of a large smelting plant on the south shore of the Great Salt lake and the Miners' Smelting Co. was organized to carry out the project; some railroad construction was planned and it was Mr. Heinze's intention to become—within the next two years—a formidable competitor of the existing smelting concerns now operating in the West.

The curtailment of production still goes on and the ore output of the mines will probably continue considerably below normal until the metal market shows improvement. The Bingham Consolidated has closed its Dalton & Lark mine at Bingham as far as the mining of ore is concerned, but will keep a small force on development; the Ohio Copper Co. has cut every possible corner, but is still pushing development; the Boston Consolidated has curtailed materially; the Last Chance mine of the Nevada Utah Mines & Smelter Co. has let out all but 15 men and a number of other mines have adopted the same policy. The Utah Consolidated, Utah Apex, Utah Development, and Utah Copper, however, continue production about as usual.—At the annual meeting of the Tintic Mine Owners' Association it developed that the mines of the Tintic district paid out \$260,000 more in wages in the last fiscal year than during the previous one. The old officers of the organization have been

elected. Clarence E. Allen, mines manager for the United States Smelting, Refining & Mining Co., is president.—The Prince Consolidated Mining & Smelting Co. has been organized in Salt Lake to operate in the Pioche (Nevada) district. It has absorbed the properties of the Phoenix Reduction Co., consisting of the Prince mine, a large tailing dump at Bullionville, mill and smelter sites, the entire area covered being about 1,000 acres. The company has been financed by the interests identified with the Ohio Kentucky company at Pioche.

The ore and bullion settlements reported through Salt Lake banks last week amounted to \$672,000.—The shortage of labor on the Western Pacific railroad, now building from Salt Lake to San Francisco, is reported to be materially relieved. The release of so many men in the mining camps during the past few weeks is supplying the demand.

Ore shipments from the Tintic, Utah, district last week amounted to 132 carloads, the contributing mines



Utah.

and amounts being: Ajax, 2; Beck Tunnel, 7; Black Jack Con., 2; Carisa, 3; Colorado, 9; Centennial Eureka, 42; Eagle & Blue Bell, 6; Eureka Hill, 2; Grand Central, 8; Lower Mammoth, 10; May Day, 5; Mammoth, 5; Scranton, 8; Tintic Iron, 9; Uncle Sam, 5; Victoria, 3; Yankee Con., 6 carloads. The milling plant belonging to the Mammoth Mining Co., at Tintic, is being dismantled. The low-grade ores of the mine will likely go to the Tintic Smelter Co.'s smelter for treatment in the future. The Mammoth company is shipping some high-grade gold ore to the Salt Lake valley smelters. The directors have posted a dividend of \$20,000. The Tetro mine has been closed temporarily on account of the lack of funds to continue development. The alterations being made in the May Day mill are about finished. The plant has been enlarged to treat 65 tons of ore daily.

The annual meeting of shareholders of the Honerine Mining Co. will be held during the next week at which time the matter of devising ways and means of paying off the indebtedness of about \$200,000 will be considered. The Honerine mine and mill is at Stockton. The installation of new equipment in the mill of the New Stockton Mining Co. is in progress.

Cripple Creek, Colorado.

Treatment Charges.—Lowering of Rates.—Important Reduction.—
El Paso Co. to Lease.—Strike in the Sacramento, Deerhorn,
Little Queen, and Old Gold.—Successful Leases.

A move of greatest importance is a concession by the U. S. R. & R. Co. in the lowering of treatment charges on Cripple Creek ores; the schedule going into effect on the 15th inst. Many properties have been compelled to close down in the last two months owing to the prohibitive rates charged by the smelting companies on low-grade ores, and the destruction of the Golden Cycle mill at Colorado City; under the new schedule, however, many mines have signified their intention of resuming, although the rate still does not equal the low charge made by the Cycle management, but it is hoped that by largely increasing the tonnage still better rates may be obtained. It will be seen by a comparison of old and new rates that ore under two ounces is particularly favored. The difference on half ounce to ounce ore is representative of the margin between profit and loss with regard to this class of Cripple Creek ores, so that a large amount of low-grade stuff will be affected by the change. The elimination of the sulphur penalty, which is a part of the concession, and always a thorn in the side of the shippers, will have much bearing on the general output; it was looked upon as extremely extortionate. Following is a comparison of the new and old rates:

Ounces of gold per ton.	New Rate.	Old Rate.
¼.....	\$ 5.25	\$ 6.25
¾.....	5.75	7.50
1.....	6.50	8.00
1¼.....	7.25	9.00
1½.....	7.50	9.25
2.....	8.50	10.25
3 (eliminated).....		11.00
5.....	9.50	11.50
7½.....	12.00	13.00
10.....	14.00	15.00

It is reported that the El Paso Co.'s property on Beacon hill is to operate under the leasing system; the upper workings from the 600-ft. level are being surveyed into blocks. Fair royalties, it is said, will be granted. The mine below the 600-ft. level is under water, draining of which depends on the tapping of the watercourse by the deep drainage adit. It is expected that about 150 men will be employed.—The Sacramento claim of the Stratton estate on Bull hill is reported to have a rich strike, the ore-shoot at a depth of 300 ft. contains a streak six inches wide showing rusty gold; assays give returns as high as \$9 per pound. The Sacramento has had many rich pockets in the past. Charles Outcault, Jack Mc-Neeley, and Otto Carrol of Goldfield (Colo.) are the lessees who made the discovery.—The famous Deerhorn mine of the Stratton estate on Globe hill is reported to have a rich strike; after much exploring for the original vein, which had faulted, the ore-shoot has been broken into, the ore appearing in kidney form with assays ranging from one to eight ounces per ton. William E. Fitts and Ollie Keener are the lucky lessees.

Blanchard & Eaton operating in the Little Queen mine on Gold hill have a new discovery that is very promising; an ore-shoot has been encountered at the junction of two veins, assays giving returns of \$50 per ton. The find is 200 ft. from the portal of the Good Will adit, and was discovered by means of a raise from the level of the tunnel 480 ft. below the surface.—The superstructure of the Stratton's Independence mill is rapidly looming into shape; the foundations of all the various buildings are completed and another month will see everything under cover. Machinery is arriving every day and so far no delay has been experienced in the construction, weather

as well as prompt arrival of material helping to make a record in building operations.—The Blue Flag cyanide plant on Bull hill is in operation; the full capacity of the mill is 75 tons per day.—The larger of the Homestake mills has just made a clean-up after a 15 days trial run, which was very satisfactory; the experiment of mixing the ores proving successful. As soon as the crushing department is overhauled the plant will be in the field for custom ores. Chief chemist Riebling is in charge.

A great deal of money is being expended this year on properties about Trail Mtn., much low-grade ore is known to exist in this area, and Hillman brothers, of the New & Half Moon group, are reported as having an important body of ore assaying from \$5 to \$30 in gold. They contemplate the erection of a cyanide plant. The Northwestern Iowa Co. on the south slope are treating similar ore at a profit.—The recent strike in the Chicken Hawk mine is proving to be of good size and assays of 1 to 3 oz. are obtained; the 500-ft. level making the best showing.—Humphreys & Thompson sent out five carloads from the Little Clara property; three cars, containing the better grade ore, comes from the famous Little Clara flat vein, where much ore is blocked out.

Toronto, Canada.

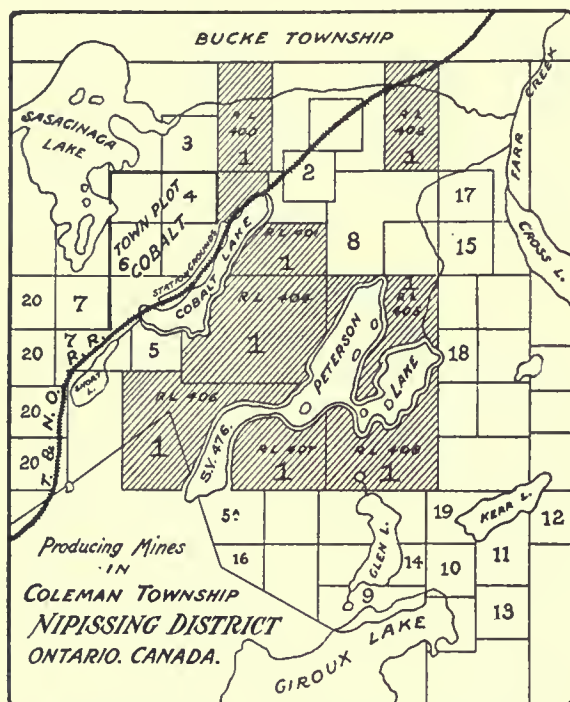
Iron Smelter at Toronto.—Shipments From Cobalt.—Recent Discoveries.—New Concentrator.—Government Receipts From Successful Mining.

An important proposition looking to the establishment in Toronto of an iron smelter for the treatment of the ore of the Moose Mtn. iron mines north of Sudbury, which are now being developed, is under consideration by the city authorities. D. D. Mann, of the firm of Mackenzie, Mann & Co., who are largely interested in the Moose Mountain, Ltd., the company formed to work the mines, has submitted a proposal under which the company agrees to erect a smelter with a daily capacity of 1,400 tons of ore to be followed by the establishment of subsidiary industries, such as rolling mills, steel plants, car works, etc., provided the city will grant them 350 acres of marsh land in Ashbridge's bay in the eastern part of the city. The land at present is mostly covered with water. The company undertakes to reclaim it if the grant is made. The citizens are generally favorable to the acceptance of the terms, but the matter is in abeyance until the City Engineer furnishes a report. The company is mainly composed of American capitalists, John W. Gates, of New York, being the president, and is capitalized at \$2,500,000, which is all paid up.

The appeal of the Dominion Coal Co. from the decision of the judge holding them liable for heavy damages in the action brought against them by the Dominion Steel & Iron Co. will be heard by the Appeal Court of Nova Scotia, which meets Nov. 9. It is unlikely, however, that the case will be reached before December. Both parties appear determined on a fight to a finish, which will probably result in the case eventually going to the Imperial Privy Council.

Cobalt ore shipments for the week ending Oct. 12 were 197 tons from the following mines: Buffalo, 30 tons; La Rose, 43; McKinley-Darragh, 72; Nipissing, 39; and Townsite, 21 tons.—The last car of ore shipped by the Foster mine netted \$36,119. On this property a vein of smaltite 6 to 10 in. wide has been found on the 75-ft. level at the junction of No. 5 and No. 8 veins.—The Airgoid mine is reported to have been sold to the owners of the Nova Scotia, which it adjoins. The men employed at the Airgoid have been laid off.—The Silver Bar mine has recently been taken over by Michigan capitalists and work, which had been suspended for some time,

resumed. In driving at the 150-ft. level a rich vein was encountered.—At the Nancy Helen the main shaft is down 123 ft. and will be put down to the 200-ft. level. Two drifts have been started at the 100-ft. level, one southeast on the main vein, which shows an average width of 8 in. of rich ore, with thick native and wire silver on one side of the vein.—J. M. Elmer, manager of the Cobalt Central, reports the concentrating plant ready for operation and states that there are 1,800 tons of ore awaiting treatment which it is expected will average about \$200 per ton. Additional ore to the value of about \$750,000 is blocked out in the Big Pete mine.—A rich 6-in. vein has been struck at the Tretheway mine at the 50-ft. level and about 15 ft. from the new shaft.—The



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|--------------------------------|--------------------------------|
| 1. Nipissing Mines Co. | 11. Kerr Lake Mining Co. |
| 2. La Rose Mining Co. | 12. Drummond Mines Co. |
| 3. Tretheway Silver-Cobalt Co. | 13. White Silver Co. |
| 4. Conlagas Mining Co. | 14. Foster-Cobalt Mining Co. |
| 5 & 5 A. McKinley-Darragh. | 15. McLeod & Glendenning. |
| 6. Buffalo Mines. | 16. Silver Bar Mining Co. |
| 7. Cobalt Silver Queen. | 17. Violet. |
| 8. O'Brien Mining Co. | 18. Star Silver-Cobalt Co. |
| 9. University Mines. | 19. Silver Leaf Mining Co. |
| 10. Lawson Cobalt-Silver Co. | 20. Temiskaming & Hudson's Bay |

new vein of the Hudson Bay has been stripped to a considerable distance and shows up better than on the surface. An assay taken of ore from the niccolite end of the vein showed \$80 in silver per ton. The vein is about 300 ft. from the main shaft and a cross-cut at the second level will be extended northward so that the vein can be worked from the main shaft. The company is erecting sleeping and dining camps to accommodate 80 men.—At the Bailey Cobalt a 15-in. vein of decomposed calcite, cobalt, and silver has been found near No. 2 adit on the hilltop. A shaft will be put down on the vein. In driving from No. 1 adit about 100 ft. three other veins have been found, all carrying native silver.—Operations have been resumed at the Little Nipissing mine and a vein struck of several inches width carrying cobalt and smaltite and showing native silver.

J. H. Black, managing director of the Strathcona Silver Mining Co., with the president, R. T. Mullin, and a party of Montreal stockholders, visited Cobalt this week. The Ontario Government has received from the O'Brien mine owners a check for \$50,992, being the amount of royalties on the output for the three months ending Sept. 30, on the basis of 25% on the value of the ore extracted. The total amount so far received, including this last payment, is \$222,945.

Denver, Colorado.

Machinery for New Zealand.—The Supply of Coal.—Railroad Greed.—Local Politics.—News From Cripple Creek.

Denver is felicitating itself on an order for a smelting plant from New Zealand, which a local company is engaged in filling. The order is not a large one, but it is looked on as the forerunner of more important ones if the plant should prove successful. The equipment is for a 150-ton hot-blast pyrite smelter, and that Denver should be chosen to furnish the machinery for a country so far distant as New Zealand is naturally a source of some pride to her citizens.

One of the burning questions in the Rocky Mountain States is the supply and cost of fuel. These States possess ample fuel resources, the larger part of which are as yet little developed. It would seem that in localities where in many places the ranchman can dig his coal on his own land, the question of fuel ought to be one of the smallest importance. Quite the contrary is the case, however. The production of coal is either monopolized by the railroad through their coal-mining branches, or else by corporations that through their affiliations with the railroads are able to control the situation. In one instance a semi-bituminous coal, mined at a point directly on the main line of a railroad, is sold at an important town on the same line and less than 50 miles away at \$6.25 per ton. In another, a lignite mined within two miles of an important city is sold there at \$3.75 per ton. When we consider how many hundred per cent on the cost of mining this is, the suspicion naturally arises that there is a nigger in the wood-pile somewhere. One of the daily papers of Denver is making a practical application of its strenuous advocacy of reasonable rates by going into the coal business itself, and selling fuel for household purposes at a reasonable rate. Such efforts are rarely rewarded with the success they deserve; there is too much opportunity for the railroad and mining companies to block the operations of anyone who is not in friendly relations with them. The attitude of the railroads in the economic development of the West has greatly changed in the last few decades. The railroads came in the guise of a philanthropic friend, aided by Federal grants and hailed with local enthusiasm, they pushed their way westward to bring the transportation facilities that were the only factor necessary for industrial development. In later years the philanthropic friend appears more like an Old Man of the Sea. Between excessive rates and unequal rates the shipper who is not large enough to enjoy special privileges has a hard time of it. Federal regulation of the railroads is likely to be a popular issue in the West in the next presidential campaign.

Local politics, beyond the squabble over the Soldiers' Home, is largely devoid of present interest. The next senatorial candidate is a subject for desultory gossip. The talk of Thos. F. Walsh seems to have subsided, although his entertaining of Secretary Taft on the occasion of his recent visit to Denver is probably much more to the point than a great deal of talk. His friends are boosting Representative Brooks, of Colorado Springs.

The new mill to treat the dump of Stratton's Independence is rapidly being constructed. Part of the foundation is already completed and it is hoped to have the entire construction finished by the first of the year, but that is doubtful. The expectation is to treat the million tons of dump material at a profit of a dollar per ton, and after it is exhausted there are large quantities of similar material as yet untouched in the mine workings. The Roosevelt deep drainage adit is at last making satisfactory progress. The rate of advance is now somewhat over 200 ft. per

month. The sinking of the intermediate shaft is progressing, and will be considerably expedited by further supplies of machinery, which arrived last week. Between the properties that have suspended operations until they can resume their contracts with the Golden Cycle mill and those that are crippled by the water problem, a considerable percentage of the mines of the area are simply marking time at present.

Nogales, Arizona.

The Patagonia Mountains. — New Railroad to Cananea. — Tube-Mills in the Black Mountain District. — News From Nacozari. — A New Smelter. — The Tabotacachi District.

Brown & Wilson, who bonded the Morning Glory mine, situated in the Patagonia mountains, Harshaw district, have been shipping from 8 to 10 carloads of ore per month, and have recently struck higher grade sulphides in the lowest workings. The ore consists of a heavy pyrite, carrying copper, gold, and silver. — The properties being operated by the Duquesne Co. are merely undergoing development, although there has recently been made a mill-run from the Pride of the West. It is stated that the mill is now shut down. The ore consists of zinc-blende, copper as chalcopryite associated with garnet; so far attempts at concentration have been rather unsatisfactory, but it is said that recent experiments with the Elmore process point to a successful solution of the problem. Previously magnetic concentration combined with wet (Wilfley) tables was used. West of Patagonia the Mansfield Copper Co. is vigorously developing and has two shafts down some 300 and 450 ft., respectively, and they are reported to be blocking out a fair grade of shipping ore.

The main topic of conversation at this time is the commencement of grading for the railroad between Nogales and Cananea; men and animals are on the ground, and a warehouse is about completed just south of town. Railroad officials expect the line to be in operation in from 8 to 10 months, but the contractors are allowing 18 months; it is, however, the general opinion that the temporary closing down of the Chivatero property and other mines in Cananea (which will involve the laying off of from 1,500 to 3,000 men) will materially assist the contractors, who will have at their immediate disposal a large proportion of these men. The construction of this road is undoubtedly going to help the city of Nogales, incidentally during the construction period, but later by the large amount of freight passing through, to and from Sonora's premier copper camp, and the intermingling of the people from both cities.

Within the past two weeks several tube-mills have passed through Nogales, destined for the Black Mountain Mining Co., near Magdalena, where the company (which already has 120 stamps installed) hopes to double its production by first crushing to 20 mesh and then re-grinding in the flint-mills. — The Llano Mining & Milling Co., at Llano, Sonora, is again running the cyanide plant on old tailing, and anticipates a nice monthly clean-up. H. Gordon Glore, of Nogales, is consulting metallurgist. — The Campana mine, in the northwest portion of the Altar

district, is running its 10-stamp mill and cyanide plant, and recently made a very satisfactory clean-up, which the manager, E. E. Pope, of Parkersburg, W. Va., believes will be improved during the present and succeeding months. — The numerous copper companies operating in the Sierra Caracahui, to the east of Llano, are quite active installing machinery, and some important strikes are reported.

From Nacozari comes the news that the Lucky Tiger group of mines in the vicinity of the El Tigre was sold to Louis N. Rohn and associates of Denver by Tim S. Lamberson of Douglas. The reported purchase price was \$50,000. Lack of transportation facilities at the El Tigre is retarding development. The stopes and bins are blocked with ore. One car of ore from the Monte Cristo mine of Carlos Soto near Moctezuma showed smelter



Map of Arizona.

receipts of \$10,400, with two more in transit that the assays indicate to be worth \$50,000. The smelter machinery for the Promontorio y Anexas is in transit from Nacozari to the site below Moctezuma.

With the advent of E. A. MacFarland, chief engineer, construction work on the C. R. Y. & P. R. R. is being resumed. The grade has been opened up to Cumpas, a distance of about 35 miles south of Nacozari. Work on the new 1,200-ton concentrator of the Moctezuma Copper Co. is progressing favorably. The structural steel is now being placed and a portion of the mill-machinery is on the ground. The Los Angeles mine of the Arizona Mining & Trading Co. is now installing a crusher and jigs to treat the second-class ore taken out in development work. The ore is mainly chalcopryite. The San Jose mine near Nacozari has resumed operations and is installing a cyanide plant. Development is being pushed at the Rosario, Credo Liberal, Antigua, and Douma properties in the Tabotacachi district and reports speak of considerable bodies of concentrating ore being opened up.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

GRINGO literally means gibberish, that is, language that is unintelligible. It is Spanish, not Mexican, and is employed as a nickname for foreigners.

IN WINTER, in Mexico, the *patio* process requires 20% more time for the completion of the chemical reactions involved, by reason of the lower temperature of the air.

THE average cost of mining and milling a ton of ore on the Rand is \$5.15. The following is a classification of 63 out of the 66 mines which produced gold during last July: Companies working for under \$4, 1; for \$4 to \$4.25, 2; for \$4.25 to \$4.50, 3; for \$4.50 to \$4.75, 8; for \$4.75 to \$5, 7; for \$5 to \$5.25, 11; for \$5.25 to \$5.50, 6; for \$5.50 to \$5.75, 7; for \$5.75 to \$6, 6; for \$6 to \$6.25, 2; for \$6.25 to \$6.50, 3; for \$6.50 to \$7.50, 5; for over \$7.50, 2.

COPPER MINES have always been fairly low-grade, comparatively speaking. Consequently it has been at copper mines that most of the mechanical improvements in mining machinery have been made. Copper mining is credited with the first successful use of steam-engines, iron skips and cages, iron and steel cables, high explosives, and air-driven rock-drills. Savery's first steam-engine was erected at a Cornish copper mine about 200 years ago. The next improvement in steam-engines, Newcomen's engine, was also erected at a Cornish copper mine, and Watt's first engine was for pumping water at Chacewater, Cornwall.

RATS are the cheapest mine scavengers there are; they are plentiful in the stopes of Bisbee and of the Comstock. The writer knows of no harm that they do underground and, considering the great amount of good that they do, he would even advise their introduction in mines where the men eat underground. Rats are good indicators of impending caves in the stopes. When the rats leave a stope (unless it is due to some obvious cause such as the introduction into a stope of air-drills where formerly hand-drilling was used) it is time for the miners to leave also. The rats sometimes bother candles and, it is said by some, also dynamite, but this damage does not amount to much. In fact the writer never knew of the rats bothering the candles or the dynamite at Bisbee where the rats have plenty of chance to do so; probably they eat the candles only when very hungry. The Malthusian principle prevents an over-abundance of rats at a mine.

At the Waihi mine, New Zealand, the thickened slime from the tube-mills is filtered in two modified Moore filters. The 'basket' consists of 9 or 11 frames, made of closely corrugated iron; these corrugated plates fit into the encircling vacuum pipes which are cut to receive the corrugated sheet. Over this, canvas is tightly stretched. Each frame is 16 by 4.5 ft.; the width of one basket across the frames is 10 ft. A vacuum of 22 in. is used and holds the cake tightly to the basket during transference. With a cake $1\frac{1}{2}$ to $1\frac{1}{2}$ in. thick a basket will hold $4\frac{1}{2}$ to 5 tons slime containing 25% moisture. Filtering takes 45 min., then the cake is washed for 45 min. in the weak-solution vat. At the Waihi 220 tons of slime is treated each day by two baskets. The cost of installation was approximately \$20,000. One man per shift is required to run the filter-plant. The running costs per 24 hr. are 3 men at \$1.92, making \$5.76; cloths

at 1 cent per ton treated, \$2.20; part services of pipe-filter, 72c.; 17 hp. to run 2 vacuum-pumps, \$7.20; power for pneumatic agitation, \$2.40; total, \$18.28, or a little less than 2 cents per ton of ore treated. At the Waihi this means a saving of 30 cents per ton as compared with treating in Johnson presses.

IMPULSE WHEELS of the best modern type for heads of several hundred feet are now provided with combination deflecting nozzles with needle valves, the governors being designed to control the deflection and some other means provided to produce slow movements of the needle valves. Ordinarily with this arrangement the needle valve which regulates the cross-section of the jet is adjusted from time to time by hand as the load varies, so that the governor, in order to maintain constant speed is obliged, most of the time, to direct the stream almost, but not quite, squarely against the moving buckets. When the load increases so that the portion of the stream which is held in reserve by the governor is inadequate to maintain the speed during sudden peaks in the load, the cross-section of the jet is increased either by an attendant or by a small electric motor mounted on the nozzle so that it may move the needle valve in or out very slowly, avoiding the severe strains on the life line which would result from the sudden cutting down of the high pressure stream. Control contacts for the motor are arranged to start it in the proper direction whenever the governor deflects the nozzle away from a predetermined position. This method is much superior to hand control, and it is as safe, for the fastest travel which the motor can give to the needle valve will not create water hammer.

THE distance between levels is generally 100 ft. in the United States, but recently there has been a tendency in the larger mines to increase this distance. In many mines at Butte the bottom levels are 200 ft. apart. At the Camp Bird at Ouray there is a distance of 300 ft. between the main adit and the working level above, but this is broken by intermediate drifts carried through the stopes about 150 ft. above the main adit. The purpose of a level is to develop the orebody and to facilitate the extraction of the ore when found. By increasing the level-interval the cost per ton of development is decreased. In a fairly uniform orebody such as the low-grade monzonite porphyries of Bingham and of Ely, where the copper occurs as a wide-spread dissemination, the levels serve mainly for exploitation. But in patchy ground, where the ore changes rapidly in value, levels are the main means of developing the ore. The more erratic the ore is in character, the closer should be the level-interval, but this should rarely (except in the case of bonanza ground) be closer than 100 ft. In South Africa it has been suggested that, owing to the uniform character of the lodes, a level-interval of 500 ft. should be adopted; but, owing to the narrowness of the conglomerate and the flatness of the beds, this, on account of the cost of getting the broken ore out of such flat stopes, is probably far too great an interval. The character of the ore, whether it is uniform or not, is often not the main determining factor in deciding the distance between levels. The method of mining the ore also plays an important part in this decision. For example, in most veins it would not be practical to have a distance of 400 ft. between levels in case a method of ore-filled stopes was to be used in mining the ore. By the time that stoping would have reached the level above, the hanging wall would be under such a strain that the cost of rendering the walls safe, as the ore was drawn, would be excessive. In all probability the level-interval in orebodies over 10 ft. in width could be advantageously increased to 200 feet.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

Deep Thinking.

The Editor:

Sir—Your editorial on "deep thinking and fast sinking" seems to me to be an editorial quibble, an equivocation which may mean much or nothing, and which leaves a chance or loop-hole for its author to crawl out of by a future explanation. With one breath you say that college men are *doing* things in the mining world; with your next, you charge our Eastern mining schools with developing dreamers, and by your comparison attempt to give the University of California a free 'write-up.'

The records of the graduates of the schools you mentioned speak for themselves. Look around you and you will find these men in every walk and phase of the mining industry accomplishing things by deep thinking and sound execution. Unfortunately, they are too busy to spread the reports of their doings with a view to receiving favorable press-notice, so they are overlooked in the mad rush of the others to get into the papers and into the lime-light.

Pride in local institutions is a worthy effort, but, Mr. Editor, do not let your pride in them and your ignorance of the others get the better of your judgment. Columbia, the Tech., Houghton, Lehigh, and the other Eastern mining schools do not deserve the literary jab you have given them while they were busy with deep thinking and earnest doing.

JOSEPH DANIELS.

South Bethlehem, October 11.

[When is a joke not a joke? When the other fellow does not see it. Mr. Daniels will find out that we were intending to be humorous in a kindly way, if he is good-natured enough to read the MINING AND SCIENTIFIC PRESS for a year or so. The Editor is entitled to demur to any charge of "ignorance" of Eastern mining schools and could reply with a force that the incident does not warrant. He has long since outgrown any such provincialism as the idea that any one, or even two, schools of mines are pre-eminently successful in training good men. Cheer up! Lehigh. You are all right, but don't take life so seriously. Earnestness is fine, but let us have a little fun as we go along.—Editor.]

Deep Sinking.

The Editor:

Sir—In your editorials in your weekly issue dated Oct. 5, I notice you publish a note on shaft-sinking and laud the records of Mr. Charles B. Brodigan and Mr. Leslie Simson, which is all in good form and well earned by these men as individuals. I wish to take exception, however, to the manner in which you have drawn the colleges from which they graduated into the subject, and the comment you make about the graduates of other mining schools.

I have always found your columns liberal and impartial heretofore and was surprised to read your sarcastic remark on the abilities of the graduates of Columbia, the Tech., Houghton, and other schools of mines. I am a graduate of Houghton and naturally take pride in the fact. Houghton, or rather the Michigan College of Mines, takes pride in the number of good practical men it has placed in the mining profession. I had charge of some sinking operations in Utah during the summer of 1906 and the results compared very favorably with pre-

vious work of that nature in that particular district. What I wish to contend, however, is that the speed with which a shaft can be sunk depends on the natural conditions, such as the nature of the surface, rock, or vein matter sunk in, labor conditions, equipment, etc., and also largely on the foresight of the man in charge of the work. Very little depends on what particular school he may have graduated from, or in fact whether he graduated from any college or not.

P. S. WILLIAMS.

Chisholm, Minn., October 10.

The Curiosities of Mining.

The Editor:

Sir—The following are some of the points that interested me on my last trip in the interior of Mexico:

1. A cam-shaft, hollow, 5½ in. outside, 4½ in. inside diameter.
2. A 25-stamp mill, 15 days' journey from the railroad, erected in six months.
3. A 75-ton mill using rolls dry remodeled into stamps with wet treatment after running a week.
4. Ore raised 120 ft. in a modern mine on chicken ladders.
5. A 200-ton stamp-mill, pans, concentrators, and settlers, which has never run.
6. Ripe watermelons and snow, within a horizontal distance of 1,000 ft. of each other.
7. A prosperous *vaso* smelting pueblo producing 5,000 oz. gold and silver bullion, from involuntary contributions of neighboring gringo-owned mines.
8. A 100-stamp mill making a profit on 4-oz. silver ore.
9. A *peon* shoveling five tons per day of rich concentrate from a 'waste' launder.

MARK R. LAMB.

Mexico, October 10.

Professional Customs.

[The questions referred to in the next two communications will be found in our issues of October 5 and 19.—Editor.]

The Editor:

Sir—I take pleasure in replying to the contribution of 'T. S.' under the head of 'Searching Questions' in which your correspondent seeks information in respect to the ethics of the mining profession as applied to the conduct of a young man about to undertake his first work. A definition of 'ethics' which comes to hand says: "The science of ethics treats of the nature of the moral agent as an intelligent and free being possessed of a conscience," and a science which deals in "ideas of rightness and oughtness."

In answering these questions categorically I shall assume that our young friend is intelligent and conscientious and that he realizes that the responsibilities are evenly balanced between employer and employee.

1. The man who is young in the mining profession will hardly have much option between taking the work on fee or *per diem* basis; he will have to meet the engagement on the basis upon which it is offered.

2. In the questions that concern the business feature of examination engagements, there should be no reason why a mining engineer should not secure himself in the matter of payment of his fee. I may be more fortunate than other engineers when I can say that I have never in my experience lost a fee. When undertaking examination work it should be in every case the engineer's particular concern to satisfy himself of the ability of his employer to pay the fee agreed upon, and the business

arrangement takes varying form according to knowledge of the client. There is no reason why the preliminary business should be loosely done; it requires, just as much as any other business, that you gauge the responsibility of your prospective client. A formal contract is not required and if the contracting party of the first part is not responsible, a written contract would not help matters much. The preliminaries of mining business should form no exception to any other matters wherein payment of money is contemplated; the agreement should be reduced to writing in letter form, and acknowledgment made in confirmation by the party accepting engagement. When an engagement is made through telegraph it is always subject to confirmation by letter.

3. Terms frequently require the payment of 50%¹ of the fee in advance and the balance upon delivery of the report, or, in cases where the property to be examined lies in a foreign country and the work will occupy a comparatively long time, it is allowable, in lieu of part payment of fee, to draw upon the client for what money is needed. When both parties are responsible, as the assumption requires, such amount can anticipate the expenses of the trip and will be willingly forthcoming.

4. The engineer is supposed to be equipped and outfitted for the work pertaining to mine examination. Such items as sacks and sampling paraphernalia are chargeable to the expense account. In my experience there was an instance where drill-steel, explosives, and blacksmith's forge had to be carried into a part of Mexico almost uninhabited, and where the natives could not handle dynamite. The circumstances permitted the charge for tools and explosives; but such cases are rare.

Don't draw fine distinctions between personal necessities, for in so doing it is easy to throw a sop to one's conscience and trespass upon privilege.

5. Would it not be fair to assume that if a man has reached the time of business responsibility, both in his personal affairs and in the affairs of his employer, that he should be competent in respect to a discriminating sense of what should constitute a just charge as against either himself or his employer. I take the ground that the agitation of this question of expense is of questionable benefit to the mining profession, in that the individual who has important and confidential business entrusted to him is not going to be drilled into conscientious habit in the putting of restraint upon him through any hard and fast rules respecting what is or is not a proper charge. When the employer cannot depend upon the honesty of the employee in these matters he had better make a change in his selection.

Viewing the matter broadly, the expense account is not an account which admits of the personal gain of the individual hired to make a mine examination; as a matter of fact, there are invariably disbursements of a kind which will leave the engineer out of pocket, because they are not fairly chargeable to the employer. In this I am reminded of the story of the accounting of Petroleum V. Nasby on his noted tour of solicitation for the Great Southern University fund, in which the item 'Refreshments, 15c.,' figured many times and with fatal regularity. Speaking from experience, the refreshment item, particularly in the tropics, would not be so individualized and would be proportionately larger.

The budding engineer would do better to leave out the items of 'entertainment' and 'incidentals,' and direct himself to a precise accounting for all expenses, taking receipts for everything and every payment that is subject to receipt ordinarily speaking. Let him keep in mind that there are men in every business who write themselves down as thieves just as soon as the expense

account is left to their personal honesty, and that such men are soon properly classified.

A form of expense account used by one of the large railroad supply companies of the United States in receiving the accounting of its employees is:

Date.	R. R. Fare & Sleeper.	Hotel & Restaurant.	Entertainment.	Incidental.	Totals.	Remarks.
1.....						
2.....						
Etc.....						

6. If given to ordinary business caution there is no excuse for uncertainty about the fee. If the young engineer has not got the sense to secure himself in the payment of his fee, he had better stay at home.

Periodical advices which put in writing the early impressions, incomplete data, and half-digested ideas in advance of the report are to be discouraged. The principals sometimes require a preliminary report which will give them information in advance of the mass of detail belonging to the final report. This is always a reasonable request; periodical reports belong to the office of the local mine management.

7. Since personal interest constitutes a bias on his opinion, a professional man cannot mix up in a stock deal at the time of reporting without directly laying himself open to the imputation of dishonesty. Men very high in the mining profession have run amuck on this very thing in speculating on a stock in advance of their clients.

Just as advice was given to the office clerk in the inception of his career: "Don't begin by emulating Rockefeller," so here I write: Don't emulate the Rockefeller of the mining profession; you will get into trouble. The moral code of some men is the penal code.

Stock dealings in the particular shares of the mine examined subsequent to the discharge of the duty imposed upon the engineer are legitimate. They are dangerous to the young engineer who does not realize that stock manipulation is one thing and the value of stock based on the merits of the mine is another thing, and not necessarily in accord. Whether plans for "private gain" miscarry or not, the man of capital does not employ the young engineer with the idea that a business trust is going to be turned into a private snap.

8. No objection can fairly be made to the circumstance of the engineer having an eye to business opportunity which may present itself within his own time and initiative, provided, of course, that such business is not prejudicial to the interests of the principals to whom the engineer is beholden.

9. Articles descriptive of mining districts, ore deposits, and vein phenomena, etc., are quite commonly prepared from notes made in the course of professional work. In this thing, too, there is the consideration of the interests of the men to whose agency in bringing him onto the ground the engineer is obligated. He will not offend if he uses good sense and discrimination in what he is publishing and weighs the particular circumstances under which publication is made.

10. Ambiguous conclusions and no conclusions are about the same thing. The capitalist or company whom the engineer is serving demands something more than a judgment which 'hedges.' If a man is hired for his judgment on the commercial question involved, which he usually is, he should face the responsibility confided to him and meet the issue squarely. As a matter of fact, as his judgment proves right or wrong in the wake of his whole experience, so abides his measure of success.

In respect to ordering new work at the mine, the engineer hired to report upon the mine and its existing workings would not be justified in spending money for such

account without the authorization from his principals. In any event the engineer would be held personally responsible by the owners of the mine for the expense incurred in the work of re-timbering ground, unwatering main workings, and recovering caved ground—all of it an expenditure for work that the owners of the mine have not seen fit to do.

There are not many beginners in mining engineering who could command such fees as to be able to risk so great a call on their own pocket-book. The "searching question" of the footing of the bills might have too personal an application.

FORBES RICKARD.

Denver, October 4.

The Editor:

Sir—It does not seem to me that the questions propounded by T. S. can be properly answered without knowing all the details, business and technical, concerned in the point at issue; namely, should an investment be made in a certain mine situated in the tropics. In this matter, common sense is all important and without it the report will be of little value in any case. However, the general principles to be applied should always be the same. The engineer should be animated by a desire to get as much and as correct information about the property as is practicable, and this information should be regarded as belonging exclusively to the employer. The same would apply to all general information gathered in the course of the trip. Thus, is the government a stable one and are the rights of foreigners respected? Is labor abundant and good? Is there a fund reserved for development? Is all of the stock issued? Is the management safe and so forth? The answers to these questions may be quite as important in determining the advisability of the investment as the intrinsic value of the property.

1. If the time required for the examination is known, it is better to charge a definite fee.

2. With reliable people, a letter signed by the principals is sufficient guarantee of payment, moreover, the law protects the engineer in the matter of reasonable fees.

3. A substantial advance on a long trip should be made and few reliable companies or principals will object to this. The engineer goes out to make or save money for his employers and not in his own interests.

4. An engineer usually has many of the instruments required for the work but any special equipment necessary to determine the value of the property or to facilitate the journey, should be paid for by the employers.

5. In regard to traveling expenses:

(a) Ammunition and medicines might easily be legitimate expenses, but hardly tobacco and laundry.

(b) The engineer is entitled to good accommodations throughout the trip if they are to be had; but the engineer who squeals at hardships has missed his vocation.

(c) The expense account should be for expenses actually incurred.

(d) Charges for necessary incidentals are proper.

(e) Vouchers for important expenses should accompany the expense account, except for railroad and steamboat fares, etc., where a definite amount is charged and known and where there is usually not time to secure vouchers.

(f) Disbursements incurred in getting pertinent information would usually be called legitimate expenses.

(g) The expense account should usually be rendered at the close of the work, but this is a matter to be determined between the parties interested.

6. In some cases a preliminary report may be valuable to the employer, and in such cases should be rendered

with due qualifications. Few companies or principals will want to invest until all of the facts are known.

7. If it has been definitely determined that the shares are selling for less than their real value, the principals should know this at once. It is bad policy for the engineer to be financially interested in the property under investigation, and if shares are bought by the engineer for himself, it should be done with the permission of his principals.

8. Few employers will object to an engineer taking advantage of the trip to get options on other properties under such conditions as in no way interfere with their interests, but the fact should be made known to the principals.

9. Since all general information relating to any district has an important bearing on any investment in that district, this information should be the exclusive property of the employer until such time as it no longer concerns his interests. In any case, it is good form to ask permission to publish articles, the material for which is gathered at the expense of another.

10. An engineer should say 'Yes' only when, in his judgment, all the conditions justify it. If there are reasonable doubts, the employer himself can best decide if, or not, he will take the risk.

Cleaning out old works should usually be done by the mine owners; but often this is impracticable. Then it may be regarded as a necessary expense, if vital to the determination of the value of the property.

H. W. TURNER.

Portland, October 2.

ACTIVITY IN CHIHUAHUA.—Mining in northern Mexico is active. Since January, 77 ore invoices covering shipments to the United States have been certified by this consulate, the total aggregate amounting to \$233,201. There is a daily train service from Ciudad Juarez into the Interior by the Mexican Central trunk line. The Rio Grande, Sierra Madre & Pacifico has a tri-weekly service, and is built wholly within this consular district. Its present terminus is Casas Grandes, 158 miles from Juarez, but the road is being extended into the timbered districts. The same company is extending the road from the timbered districts at Medara, and will continue until the two projections meet. There is to be an extension of the same road to the coast. Lumbering is a new industry, and judging from the progress made in the past few months it is apparently a profitable one. As yet no lumber has been exported, as all the necessary timber machinery has not been received and put in operation. At present there are in operation and in course of construction an extensive drying shed, sawmills having a capacity of 500,000 ft. of lumber per day, a 45-acre storing and floating lake, planing mills, and turpentine stills.—U. S. Consul at Ciudad Juarez.

SULPHUR IN BALUCHISTAN.—The geological department of Baluchistan has made an examination of the sulphur mines of Sanni, in the Siwalik sandstones and clays. The mines have not been worked for many years and have collapsed to such an extent that they have become very difficult of access; besides which parts of them have caught fire; some of the clay bands are said to be so full of sulphur that they burn readily. The amount of sulphur impregnating the rock seems, it is believed, quite sufficient to hold out prospects of remunerative working, especially taking into account the favorable situation of the mines at the edge of the Minhi plain. In the neighborhood of the sulphur mines the rock is traversed by numerous veins of alunite.

The Mt. Morgan Mine.

The accompanying photographs of the great Mt. Morgan mine will prove interesting. This mine is 25 miles southwest from Rockhampton, in Queensland, Australia. The Mt. Morgan is one of the grand ore deposits of the world, for it had yielded 3,079,695 oz. of gold up to the end of 1906; the total output has been worth \$60,964,087, and out of this there has been paid \$32,757,705 in dividends. To these figures can be added the output for 1907, which will be worth about \$5,000,000. This has been done in twenty years. The original property consisted of a 'selection' of 640 acres taken up, for the purpose of grazing, by Donald Gordon, in 1873. Becoming acquainted with the brothers Morgan, who also held land in the district, he showed them one day a piece of gold-bearing quartz, which he had picked up in Mundic creek. This stream flows at the base of the hill called Mt. Morgan; it is only 500 ft. above the surrounding country, and



Fig. 1. Mt. Morgan Mine.

Steam-shovel in foreground of an open-cut. Old square sets in background.

1,225 ft. above sea-level—at least, it was; for mining operations have removed the crest of the mount, which has become a huge quarry of gold ore. Gordon agreed to show the Morgans where he found the rich 'float,' and in return he is said to have received £20 and as much whiskey as he could drink. On the low wooded hill overlooking the creek he pointed out to them the silicious ironstone. This exhibited gold in places; the Morgans sent samples to Sydney, and the results of the assays proved the ore to be richer than it looked. They purchased Gordon's holding of 640 acres for £1 per acre, that is, about \$3,200. From this ground a profit of over \$32,000,000 has been won!

The three Morgans subsequently sold, first a part, and eventually the whole, of their interest in the property. In 1886 a company was formed with a capital of one million shares of £1 each. These shares rose in 1888 to £17 5s., giving the mine a market value of over \$86,000,000. These shares are now quoted at £4. Many fortunes have been made, and lost, in the twenty years during which the mine has been so productive, for, to quote the language of a managing director at one of the

annual meetings, "Mt. Morgan is after all only a gold mine, and is consequently subject to the vicissitudes of all mineral formations." The thing to do is to get on the side of the right 'vicissitude,' and not stay there too long.

For several years the ore was broken in benches, 30 ft. high and 300 ft. long. A central shaft connected these with the main adits. The drilling was done with 'jumpers' or long bars of steel, raised and dropped by hand. As underground exploration advanced, the hill became dissected by cross-cuts, and finally a deep shaft was sunk below the level of the creek at the base of Mt. Morgan. Deeper exploration found sulphide ore under the silicious ironstone of the big gossan, and beyond the body of gold ore there was discovered a copper deposit, containing some gold also. Last year a copper smelter was completed, and now this mine produces 4,000 tons of copper per annum.



Fig. 2. Head-Frame at Mt. Morgan.

A correspondent, who recently visited the mine, writes to us saying: "The big deposit is worked as an open-cut (Fig. 1), the system employed resembling that adopted at Mt. Lyell. The mill-holes from the surface lead to floors supported by square sets. Here an electric motor draws the loaded cars to the side of the hill. The position of the mill-holes is largely governed by the position of the andesite dikes which cut through the ore deposit.

"People speak of the 'gold lode' and the 'copper lode' as if they were two distinct things; as a matter of fact they are one and the same; the portion of the orebody that is sent to the smelters carries more copper and less gold, while the portion sent to the chlorination works is silicious, and contains more gold and less copper. The two parts are roughly separated by a dike. The ore is really a large body of shattered Gympie formation, mostly quartzite, cut through with dikes and impregnated with pyrite. The 'gold lode' is worked by the square-set system, because it is considered unprofitable to mine the whole formation, and that by using the square-set system they can work out a small portion and leave the rest; but on looking over the plans, it seems that they are encroaching on what was formerly considered unpayable 'stone,' and it is highly probable that it would pay

better to work the gold as an open stope as they do the 'copper lode;' it would be cheaper and they would not lose anything. The head-frame and ore-bins (Fig. 2) constitute a good structure, designed by some graduates of Sydney University. Being for an underlay shaft, there were no complicated strains to work out, but it is



Fig. 3. Mt. Morgan Mine, Queensland.

Illustrating mill-hole system in open-cut.

well built all the same, and the crusher on it does not give any vibration at all. The rails are fastened to the sills of the shaft sets which are concreted in position. The steam-shovels (Fig. 3) are only used for stripping. There is one central electric station that supplies the necessary power. The hoisting is done by an electric hoist, the indicator of which, when it goes past a certain point, works a cut-out switch; this stops the engine and prevents overwinding. The water-jackets have the inside portion of copper plate, while the outside is steel. It is intended to build one large circular forehearth instead of two smaller ones. The lower jacket goes right to the bottom of the furnace. A so-called vaporiser is used with each of the furnaces. This is a tank, shown in the photograph (Fig. 4), into which the heated water from the jackets pass. At the bottom of this the air-pipe is let in. The air is partly heated by the water and the water is partly cooled by the air. This arrangement is found to save two-thirds of the water. The slag-pots are run out to the dump on a mono-rail overhead. A movable terminus hangs well over the tip, and when necessary another section of about 20 ft. is inserted between this and the fixed rail."

The general manager is G. A. Richard and his assistant is H. P. Searle. Both of these engineers recently visited the chief mining regions of America, seeking progressive ideas. One result was the decision to treat the blister copper locally; in furtherance of this idea, the Mt. Morgan Gold Mining Co. took a large interest in a company formed to erect an electrolytic copper refinery. This refinery was built by Hirsch & Son of Halberstadt, Germany.

Tantalum.

The fruitful activity in experimental metallurgical work during recent years for both scientific and commercial purposes, especially in electro-metallurgy, has made possible the reduction of metals that were before unutilized and almost unknown. The determination of the properties of these metals has suggested uses for them, with the result that there is a growing demand for ores that but a few years ago were sought only as mineral curiosities.

One of the most remarkable of these metals is tantalum. It is not attacked by hydrochloric, nitric, or sulphuric acids, aqua regia, and alkaline solutions. It can be drawn into fine wire having a tensile strength greater than soft steel. A red-hot lump of tantalum may be at once hammered into a plate which, on repeated re-hammering, becomes as hard as diamond. A diamond-drill, running continuously for three days at 5,000 revolutions per minute, failed to penetrate such a plate, although it was but one millimetre thick, while the drill was much worn. A British patent has been obtained for making writing pens from tantalum, whose hardness, elasticity, and resistance to corrosion would seem to fit it

well for such use.

Tantalum is now employed principally as a filament in an electric incandescent lamp, which was put on the American market in 1906. This lamp consumes but two watts per candlepower, as against more than three

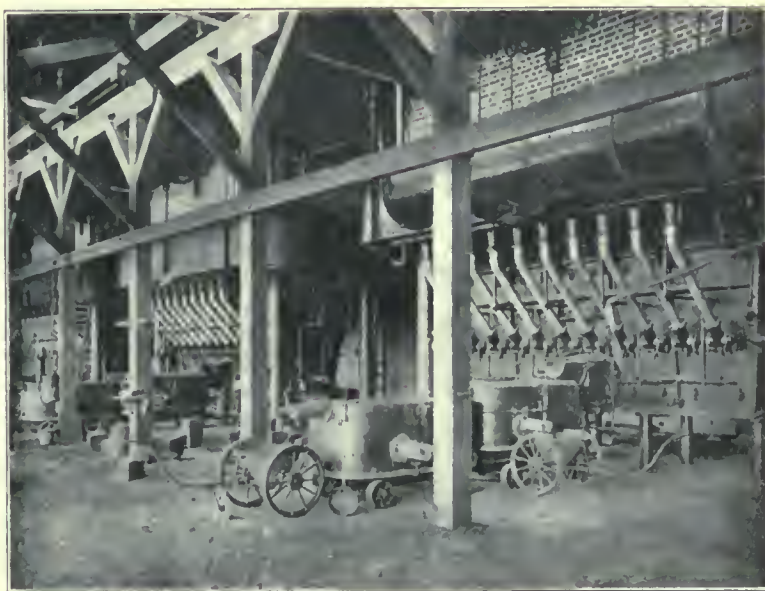


Fig. 4. The Copper Smelter at Mt. Morgan.

watts per candlepower for the ordinary carbon filament lamp.

ITALIAN AND JAPANESE ANTIMONY.—Large quantities of antimony are mined at Pinerola, near Turin, and throughout the Sardinian islands, some of it being exported. The recent great decline in the value of antimony is due solely to Japan having offered it at about \$16 per quintal (of 220 lb.), a price which is deemed low in Italy.

The Copper Situation.

BY JAMES DOUGLAS.

*There has been for the last 10 years an average rate of 84 tons of iron consumed to 1 ton of copper. The world's demand for the two metals was in the same ratio, and the world's production of copper also shows a notable percentage decrease. The production was in 1897, 405,350 tons, and in 1906, 718,368 tons, or an average increase for 10 years of 4.3%, whereas between the production of 1905, which was 699,504 tons, and that of 1906, there was a gain of only 15,754 tons, or 2.03%; hence the rise in price. That iron did not sympathize in price is due to the fact that the undeveloped resources of iron ore and the metallurgical appliances for its reduction to metal, are much greater than those of copper. Consequently iron can bear a temporary strain better than copper. Moreover, the standard price for iron has been fixed at a figure high enough to compensate for wide variations in the market.

Between the price of rails early in 1897 of \$16 per ton, and the present price of \$28 per ton, there is, however, as wide a difference as between the price of copper in 1896, \$10.88, and the price of copper in 1906, \$19.62. But there can be a policy pursued in regulating the home prices on iron which cannot be followed in the case of copper. Iron is protected; copper is not; and, therefore, if desired by the large manufacturers of iron to maintain a staple price, the very large margin of \$11.20 per ton of steel and of \$4 per ton of pig iron, which the duty gives them, may be used. In case of a low foreign price, a high domestic price can be sustained; or in case of high foreign price, the domestic price may be maintained at a given standard up to the limit of the duty. The McKinley bill struck off all duty on crude and refined copper, though retaining it on manufactured copper. Thus, the world's price regulates the American domestic price, and the copper producers have been saved from any temptation to form a copper trust, in order to derive the benefit of the duty. As to the regulation of price, considering our supreme position as producers, it may be more proper to say that we fix the price of the world. For a short period this year, the English price ruled slightly lower than the price demanded in the United States, and copper immediately commenced to flow in from abroad, although over any considerable period of time, say the past ten years, 54.5% of our production has been exported and we make 54.7% of the world's total.

In spite of the active demand and the high price, last year's domestic production showed that there were only two years, since copper became a prominent article of domestic production, when copper production showed as slight a percentage of gain. A steadily progressive high percentage increase, however, cannot be maintained and should not be expected when the gross increase reaches certain limits. For instance, in 1896, when the percentage of increase over 1895 was 21%, the actual increase was 81,168,640 lb.; but during the last decade, the production has increased at such a rate that the 4.8% increase of 1906 over 1905 represents an actual increase of 42,378,560 lb. of copper—an increase of 137.4% over the production of 1895, or 451.1% over that of 1885.

Still, it is significant that this notable falling off in percentage increase should occur when the high price of copper may be supposed to have served as a stimulus to the utmost activity. The world's increase, as well as our own, showed a diminished percentage of increase—being 2.16% instead of 6.16% of the previous years. To explain this anomaly, it must be borne in mind that as

the average of the per cent of the ore treated was probably lower, more ore in proportion to the output of copper was probably mined. When copper is 20c., money can be made out of ore which is valueless with copper standing at 12c.; and, therefore, should the contents of the mines permit of selection, ore is utilized at one time which at another time is rejected. Moreover, the average percentage of ore of the great mines of the country is declining, and will continue to decline. Rich bodies of secondary deposits may be discovered in any deep mine, which may arrest the decline in its average yield, but the world's experience is not likely to be reversed in our favor—more especially as it coincides with our own—that the average yield of deep copper mines declines with depth; and as with declining yield generally occurs the increased cost of mining incident to greater depth, two factors concur to bring about the reduced production, which must occur sooner or later.

In comparing iron and copper mining, and the ease with which the varying demands of trade may be met by the producers, it must be remembered that two tons of average iron ore from the most prolific source now available—Lake Superior—will make one ton of metal; whereas from 33 to 75 tons (say an average of 50 tons) of copper ore must be mined to produce one ton of copper. A sudden increase in demand for the baser metal can be more readily met than when such a call is made for the rarer. The relative supply in nature may be gauged by the value on which the price of each is made, the value of iron being generally quoted by the ton, and of copper by the pound. Last year's production of iron was made from approximately 50,000,000 tons of ore. Our copper mines, to yield a production of 900,000,000 lb., must have handled approximately 22,000,000 tons of ore, or nearly half the quantity of ore raised from our iron mines. The ore of iron, moreover, occurs in very large deposits, worked in some cases by steam shovels, whereas our copper comes from comparatively narrow veins or irregular masses.

Referring to the relative growth and decline of the three principal sources of the metal since the Western States began to grow into prominence, say from 1882, we find that at that date the Lakes supplied from ores of metallic copper 25,000 long tons of copper; Arizona, from oxidized ores, 8,000 long tons of copper; and Montana, from sulphide ores, 4,000 long tons. After that, the Lake production relatively declined. The Montana production continued to increase rapidly until 1887, when Montana took the first place with 35,000 tons, Lake Superior second place with 34,000, and Arizona third, with 8,000. This order was maintained until 1905, when Arizona attained the second rank.

The largest sources of new supply, which can be counted on with tolerable certainty, will be found in the low-grade ores of Utah and Nevada, where works on a very large scale are being planned or erected for their treatment.

The presence of small quantities of gold and silver in copper ores, now that the process of electrolytic copper refining permits these elements to be cheaply separated among the impurities, is putting within the range of profitable extraction ores of very low percentage in copper. When the Anaconda mine was first opened and its rich ores (and subsequently the mattes, made from them) were shipped to Europe for refining, the margin of gold and silver deducted from the ton of copper, before any allowance was made to the shipper, was \$60. As this deduction was substantially the whole of the precious metals in the Butte copper, the company derived no benefit. Whatever margin there was in the \$60 over and above the cost of separation went to the refiners.

*From *The Engineering Magazine*, October 1907.

Most of the rich argentiferous copper was then converted into bluestone. But since electrolysis has been applied to copper refining, and the process has been carried out on a large scale, the commercial charges for refining the copper and separating the precious metals have been reduced from \$60 to \$16, and as the value of the electrolytically refined copper is ordinarily about \$10 per ton above that of furnace-refined copper, copper bars containing \$6 in precious metals can be economically converted into electrolytic, and their gold and silver added to the world's wealth. If the copper bars contain the concentrated gold and silver of 30 tons of ore, the ore need contain only 20 cents of gold and silver per ton to make it profitable to submit the resulting copper to electrolysis. The amount thus extracted from domestic and foreign ores in the refineries of the United States is approximately: From Montana, \$6,650,000; Arizona and Sonora, \$2,105,000; Canada, \$460,000; and other sources, \$2,500,000—or over \$11,000,000—most of which formerly entered the refined copper and was wasted.

While the presence of precious metals in high-grade ores redounds to the fortunate copper company which mines them, when ores of 2 per cent and under (like those of the Boundary district of British Columbia, or Bingham canyon in Utah, or of Ely county in Nevada) are treated, the addition of \$2 or \$3 in gold and silver per ton may convert an unprofitable into a very profitable mineral. And from such ores will probably come much of the copper from our new mineral developments; for it is not probable that within the explored territory, many new large deposits will be discovered which are also of high grade, whereas lean ores in very large quantities are known to exist in many districts of the country. Apart from their contents in precious metals, better machinery and improved metallurgical methods permit of ores being treated economically today which would not have been classed as ore a few years ago; and today ores are rejected in developed mines which at no distant day may help us to maintain our position in the copper world.

To forecast the future of copper is impossible. It is safe to predict that, if no substitute is discovered and the demand for the metal increases as it has done during the modern industrial era, the supply will fall short of the demand and the value of the metal will rise. The same is true of all the mineral products that are consumed in the arts. The experience of the last few years in the United States illustrates, however, the sensitive connection between demand and price.

While such spasmodic variations are transitory, there can be no doubt that if the demand grows and no very important new discoveries are made, the metal will become scarcer and will command a higher price than the average price of the past. One consequence, which will also be a corrective, will be that the metal will cease to be used for purposes to which it is turned today, and for which a cheaper material can be discovered. For it is an invariable rule that when the metal has run up above a figure which deters purchasers from using it except for unavoidable purposes, the consumption drops off sharply, and a more normal value is restored.

A review of the world's mines would seem to indicate that the old mines are approaching exhaustion, that no new large deposits of rich ore, except possibly those of Tanganyika, are in sight; and therefore the trade must turn to deposits of lower grade than have heretofore been worked, if the demand continues as active as at present. And copper cannot be made as cheaply from mines of that class as from the mines we have been drawing upon so recklessly for a generation.

The next question bearing upon values is that of probable consumption. The three principal uses to which

copper is now turned are: The manufacture of electrical machinery and the transmission of electrical current; in the composition of alloys, principally brass, for stationary engines, locomotives, railroad cars, automobiles, and for arms and ammunition, and in architecture; where it replaces iron and lead.

Glancing at the three sources of consumption, the draft on copper for telegraph wires, trolley lines, long-distance transmission, and other electrical purposes, is of comparatively recent date, and is doubtless very large—probably about one-third of the world's supply goes into this new industry; but comparatively little of it is actually consumed, though a great deal of it is through carelessness wasted during the installation of plants. The copper remains in service with little waste, or goes back to the refineries as scrap. But the demand for this purpose will not fall off. The urban and interurban mileage of trolley lines in the United States is between 30,000 and 40,000 miles. They have been built within very recent years, and new lines are reticulating the country. No substitute for copper in this class of roads has been suggested, for though aluminum may indifferently replace copper for current transmission, it cannot bear the wear and tear of the trolley. Gradually, also, the motor will displace the locomotive on all our present steam roads where traffic is dense; and though the third rail instead of the trolley wire will be used, the amount of copper which goes into the transmission, the generators, the motors, and all subsidiary appliances, will increase the proportionate demand for the metal by electricians.

The amount of copper which enters brass and other alloys it is difficult to determine. From information derived from several of our large railroad systems I would infer that about 5 grains of copper are consumed and actually go out of existence per car mile. This would represent about 5,000 tons of copper consumed by our railroads per annum for this purpose alone. Automobiles must make a new and very heavy call on copper, and the demand for stationary engines and steamboats is increasing with the growing industrial activity of the country. The quantity used up in war material and ammunition—during peace and war—is very great. In spite of probable fluctuations in the brass trade, there will be a large and satisfactory average growth.

But when we come to the third principal use for copper, that is, in the building and house-furnishing trade, we find it playing the part of an article of luxury. Our forefathers were satisfied with wrought-iron railings in their city houses, beautiful examples of which still exist in all the west-side streets of the old residential portion of New York City. Now we must have bronze balustrades in our palatial offices, hotels, and private buildings. Brass or bronze hinges or locks, gas fixtures, etc., appear in profusion in our houses and railroad cars, and brass and copper have driven out lead for roofing and plumbing. When copper is abundant and sells at a moderate price, it is the most desirable material for these purposes, but as it becomes rarer and dearer, substitutes for it will be used. As long, however, as money is forthcoming, the public taste for brass or bronze will be gratified, and probably more of the world's supply will go into architecture and house-furnishing than in any other use.

From the above review of the sources of supply and the sources of demand, it would seem that while there is no risk of copper becoming a rare metal in the near future, it will certainly have to be extracted from much leaner ores at an increased cost. Also while there is no reason to believe that its consumption in the arts will grow less, there are metals which can be substituted for it, should the popular taste or financial exigencies require.

The Charging of Blast-Furnaces.

Written for the MINING AND SCIENTIFIC PRESS
By E. H. MESSITER.

*The basic feature of the arrangement here described is the ore-bedding system designed and patented by the writer and manufactured by the Robins Conveying Belt Co. This consists of (1) suitable arrangements for transferring the ingredients of the charge from railroad cars to belt-conveyors, (2) means for crushing and sampling, (3) a

The great flexibility in the design of the plant resulting from the use of the belt-conveyor is of particular advantage at this point. Duplicate crushers may be used to give different sizes for different materials, and as many sampling units as desired may be introduced to give facilities for cleaning and to provide for different classes of ore. Likewise it is a simple matter to introduce screens for the purpose of diverting fine material from the blast-furnace plant as in the case of a copper reduction works using both shaft furnaces and reverberatories.

The storage beds are made by depositing the charge ingredients in long narrow piles of triangular cross-section in such a way that the piles are uniform as to composition and physical character throughout their length. No attempt is made to secure uniformity transversely to the bed. In other words, every cross-section of the bed is exactly like every other cross-section, while one material may predominate in the top or bottom of every



Fig. 1.

bedding and storage plant, and (4) devices for delivering the charge from the belt-conveyor system to the furnaces.

The first operation involves the use of bins or hoppers and proper devices for delivering their contents to the belt-conveyor. The traveling shaker feeder is admirably adapted for this purpose. Fig. 1 shows a series of receiving bins with conveyor and feeder-car. The bin-gates are made large and stand wide open while the feeder is in position below.

The shaker-feed car is a hopper mounted on a carriage astride of the conveyor and having a reciprocating pan under its discharge opening. The pan is so placed as to prevent any flow of ore over it unless it is in motion. Its stroke

and inclination are adjustable, as is also the size of the outlet of the hopper. An electric motor on the carriage imparts motion to the pan and propels the carriage itself when desired. In connection with suitable bin-gates the whole constitutes a device for delivering the contents of the bins to a belt-conveyor with the least possible labor and the fewest possible interruptions.

The crushing and sampling are accomplished by machines selected to suit the requirements of the work.

section and the coarse material may predominate at the bottom and sides.

By removing material simultaneously from all parts of the cross-section of the bed, as is done by the reclaiming

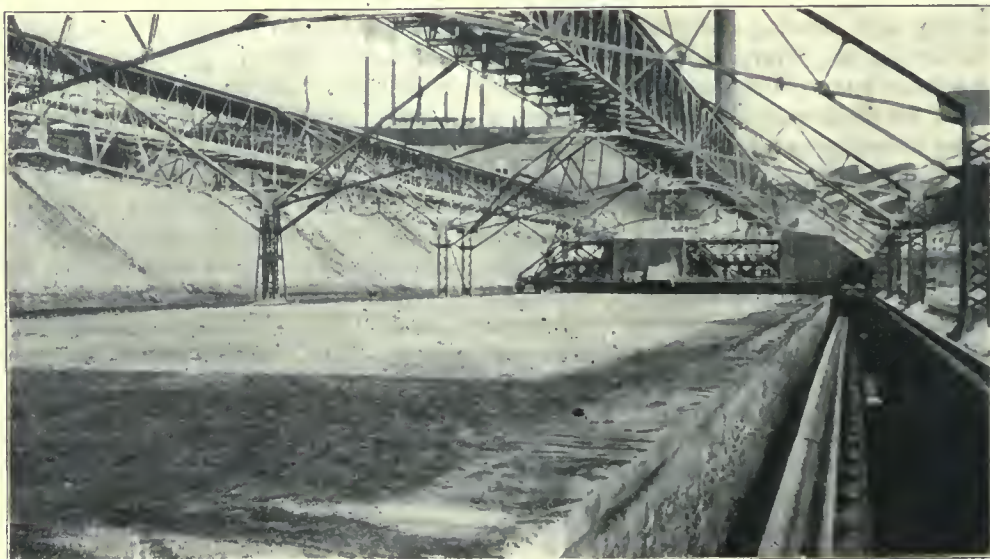


Fig. 2.

machine, the mixture obtained will not vary from one end of the bed to the other.

The photograph, Fig. 2, shows the skeleton structures carrying the belt-conveyors over the beds, the reclaiming machine and the receiving conveyor at the right of the picture. The overhead conveyors are equipped with special ore-bedding trippers traveling at such a speed that very little is deposited in one place at a time. The result is a bed of the character described above. Such a bed is seen in the photograph on the left. The ore-bedding tripper is a carriage astride of the conveyor,

*A few notes on this interesting development in metallurgical practice appeared in our issue of April 27, 1907. The subject warrants the full account given herewith.—Editor.

equipped with two pulleys, around which the conveyor-belt passes in the form of a letter S. On the shaft of one of the pulleys are two traction wheels, the alternate engagement of which with the rails and with fixed brakes determines the motion of the tripper. The total number of parts in the tripper is small and the wearing parts are few and inexpensive.

The reclaiming machine is a traveling bridge spanning the width of the bed and its trench-conveyor. Under the forward side of the bridge is suspended a scraper-conveyor of special design, operating in a steel trough consisting of a nearly horizontal bottom plate and a vertical back plate. The conveyor flights are inclined to the axis of the conveyor and are provided at their front ends with plough-shaped extensions which project beyond the bottom plate. All material within reach of these flights is swept onto the plate and carried along to the end of the machine, where it falls through a short chute to the trench-conveyor.

A triangular harrow, covering the entire cross-section of the bed, is mounted in front of the machine so as to be adjustable as to its inclination and to be slowly but powerfully moved back and forth. The relation between the spacing of the harrow points and the stroke is such as to dislodge material in a continuous manner from all parts of the face of the bed, which material rolls down to the conveyor and is carried by it as described above. An electric motor with simple geared connections drives the conveyor and harrow. An additional motor of smaller size is connected with the wheels on which the bridge rests and is geared to advance the machine automatically into the pile at any desired rate or to run the machine forward or backward at a higher speed when it is being transferred from one bed to another. The movement of the machine from one set of tracks to another is accomplished by means of a motor-driven transfer car. A reserve machine may be kept in a repair shed placed alongside the transfer-car track.

For proper storage capacities (such as are provided in all the larger smelting plants) the first cost of the bedding conveyors with their supporting structures, the trench-conveyors, and two reclaiming machines with transfer car (In other words, the whole first cost of the storage and reclaiming system) is less per ton of capacity than that of any type of bins from which the ore can be drawn by gravity. When the extremely low operating cost incurred at the beds is considered, it becomes evident that this system has everything to commend it as a simple storage plant even where bedding is not a necessary feature of the process.

The trench-conveyors alongside the beds connect with one or more other conveyors which deliver the complete mixed charge in the furnace-house. The charge can be deposited on the feed-floor for hand feeding, or in bins from which it is fed into the furnace, or any one of a number of types of mechanical feeders may be used. It can always be arranged to feed the fuel separately if considered necessary. The whole cost of handling from car to furnace becomes a small fraction of the cost by the usual methods, and metallurgical and other advantages of far-reaching importance are obtained.

Fig. 3 shows a typical arrangement of plant. There are three unloading tracks built on low trestles. Under two of these tracks are placed a number of receiving-hoppers, while the third is so placed as to permit cars to be unloaded from it directly into the sampling-mill. Conveyors A1 and A2 are placed under the receiving-hoppers and a traveling shaker-feeder is provided for each conveyor. Conveyor B receives the material carried by A1 and A2, and delivers either to a crusher or to conveyor C, which in turn delivers either to the sam-

pling apparatus or to conveyor D. A traveling tripper on conveyor D will discharge at will to either of the bedding-conveyors E1, E2, E3, which are placed in the skeleton structures over the beds. These conveyors extend over the entire length of the beds and are equipped with high-speed ore-bedding trippers.

Rails are laid on the ground on each side of each bed for the reclaiming machine, which removes the material from the bed and delivers it to conveyors F1, F2, F3, placed in trenches parallel to the beds. Conveyor G is arranged to receive from either of conveyors F1, F2, F3, and to deliver to conveyor H, which runs through the furnace-house over the several furnaces.

With the exception of small lots of high-grade ore, which it may be desirable to unload directly from track No. 3 into the sampling mill, all incoming ore, fuel, and flux will be unloaded into the receiving bins on tracks 1 and 2. Starting with the bins empty, a day's receipts are unloaded into them, selecting the bins in any way with the single precaution that all of the material in any one bin shall belong to the same lot. Any one lot, how-

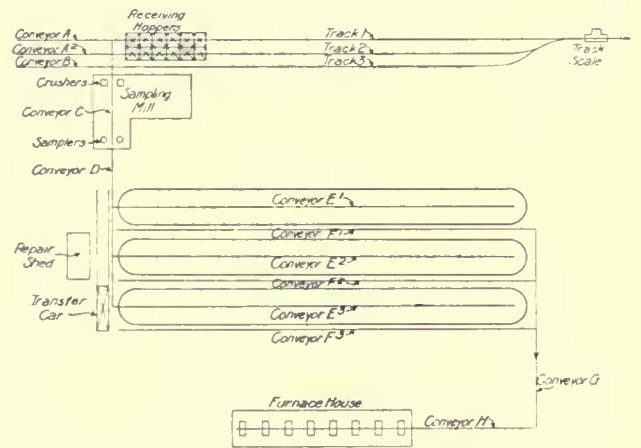


Fig. 3.

ever, may occupy as many bins as necessary. For each carload there will be a card or ticket left at the bin, giving the lot number and any other information necessary.

When ready to commence bedding, the operator on the shaker-feed car will receive a signal from the operator at the samplers indicating that the conveyors to the bed and the samplers, etc., are running and ready to receive ore. The feeder operator will then open one of the bin-gates wide and start the feeder. After the first bin is empty, if any other bin in either row contains ore belonging to the same lot, the shaker-feed car will at once travel to it and empty it in the same manner. When the last of any lot is delivered to the conveyor the feeder operator will signal the sampler operator and the latter will set the deflecting chute at the top of the sampling tower into position for delivery to the samplers, which were idle during the passage of the previous lot, and signal the feeder operator when it is done.

The feeder operator now sends along the second lot in the same manner. During the passage of the second lot, the sampler operator will remove the one one-hundredth sample of the first lot, attaching the identification card or cards which will have been sent to him from the unloading bins. He will then clean the idle sampler and crusher, and wait for the signal announcing the end of the second lot. This routine is continued until all the bins are empty. Thus the duties of the feeder operator and the sampler operator constitute all the control that is required in the bedding operation. A conveyor operator or oiler will patrol the conveyor lines and attend to sweeping and lubrication. The grease-cups will need only

to be turned slightly every day or two and be filled, perhaps, once a month.

When returned slag is included in the charge, the manner of placing it on the beds will depend on circumstances. In general, a crusher placed where the slag shells are dumped and a conveyor delivering to conveyor D will suffice. If it is more convenient to transfer the slag in railroad cars, it will be unloaded into the receiving hoppers and be sent to the beds in the same manner as the other materials. In like manner the handling of briquettes, if any, will depend on local conditions. If dried in the open air, the wet briquettes can be piled along the edge of the bed next to the belt-conveyor, into which they will be gently swept by the reclaiming machine. This will avoid a second handling.

The beds themselves will now be considered with reference to the process of making up the charge in them. The cycle of each of the beds consists of three stages. In its first stage a bed constitutes an overflow receptacle for the materials on hand over and above what is needed for the bed in the second stage. The bed next enters its second stage during which it is, or becomes, a reserve bed ready for use when the one ahead of it is exhausted. In its third stage, the bed constitutes the immediate supply of the furnaces.

In a plant employing three beds there will be at any particular time one bed in each of the three stages. Assuming beds of 10,000 tons each, let us say that this is one week's supply. Then a complete cycle for any bed will occur every three weeks and any bed will continue in the same stage for one week. In any particular week, the bed which is in the third stage will be in use, supplying the furnaces. The ore, fuel, and flux received during the week will be deposited in one or both of the other beds, according to circumstances. If the second-stage bed is full and of the desired composition, the week's receipts will all go into the first-stage (overflow) bed. If the second-stage bed is partly filled or empty the week's receipts will be used, first to complete this bed, and the excess, if any, will go into the first-stage bed.

In carrying out this operation, the total weights of SiO_2 , FeO , CaO , etc., that are wanted in each bed will be decided upon and before a carload is ordered to the unloading bins, it will be determined which bed is to receive it, and this will be indicated on the card that accompanies the car. When the desired quantity of any particular component of the charge has been put into a bed, the bed is complete as far as that component is concerned and subsequent receipts of that class of material will go into the next bed. Only one rule is necessary for any carload of charge material, namely, send it to the second-stage (reserve) bed unless its contents would raise the total quantity of any component in that bed above the assigned limit in which case it must go to the first-stage (overflow) bed unless it would exceed the limit there also.

The latter event will occur only when the whole storage capacity in the beds for some particular element is used. The situation is parallel to what would occur in the system now in use if all the bins assignable to a particular ingredient were full. When it occurs, the car must either be held until another bed is started or unloaded elsewhere. When one bed has just become empty and another started there is room to store three weeks' supply of any and all components, but just before a bed is used up and before it can receive any new ore, there is room for only two weeks' supply. Consequently, the necessity of holding any car or of unloading it elsewhere can occur only when there is from two to three weeks' supply ahead of the material contained in it. A fourth bed can be added at any time or at the start if desired.

There would then always be three beds or 30,000 tons available in addition to the bed in use.

When the receipts of ore, etc., fall below the requirements, the amount on hand, at the beginning of the period of shortage, will determine the length of time the shortage can continue without the necessity of shutting down furnaces or of changing the charge. It will be exactly the same length of time that would elapse if the same quantity were stored in separate bins and the same charge were run. With a continued shortage, the quantity on hand in the reserve bed will be smaller and smaller until it becomes so small that it cannot be brought up to the full tonnage by the end of the week. After that, if the shortage continues, the size of the bed will be gradually reduced, each successive bed containing as much charge as can be made up from the materials received while the preceding bed lasts. During such a period there is no change of routine and no departure from the general rule given above for the disposition of any carload. We simply change often from one bed to another, and this may be continued without any inconvenience until the beds become so small that they last only a day or half a day.

Briefly, if at any particular time there is two weeks' supply in the beds and there occurs a protracted shortage amounting to one day's supply per week, it will be 14 weeks before the charge must be changed or furnaces blown out or other storage drawn on. If the shortage occurs in any one essential ingredient as silica, fuel, or lime, at the rate of one day's supply per week, it will likewise be 14 weeks before one of the above changes will have to be made. In the one case, the third or overflow bed will disappear, but in the second it will not, but will become devoid of the particular ingredient which is running short, and can at once be restored to proper composition if a supply of that ingredient comes in.

The arrangement of the apparatus by no means limits the operations to the scheme above outlined, as will be seen from the following remarks:

1. The reclaiming machine will operate equally well on a bed of any cross-section up to the maximum.
2. The travel of the ore-bedding tripper is adjustable.
3. Any bed may be put into use at any time its contents have the proper composition for smelting, no matter how small the total quantity in it.
4. Any bed may be put into use while partly full and can be brought up to full cross-section, while it is supplying the furnaces by adjusting the travel of the tripper to cover a part of the length of the bed.
5. Either bedding space may be used for several short beds instead of one long one.
6. The composition of a bed may be changed while it is in use.
7. A carload of any material placed in a bed through error, cannot alter the percentage of any ingredient more than one-third of one per cent, nor measurably increase the cross-section of the bed. One hundred tons added to a full bed will increase its width about one inch on each side.
8. When it is desired to adjust the composition of a bed, the adjustment may be made to apply to any part of the bed, however small, by limiting the travel of the tripper to that part of the bed.

A narrow chute placed in the path of the stream from the traveling tripper will collect a perfect sample of the material that goes into the bed. It will take the whole stream part of the time at regular intervals. In making up a bed, ore and flux can be put into it for several days with general knowledge of the ores as a guide. An analysis of the sample of the bed will then be made the basis for subsequent additions. By making an analysis a

day or half a day before the bed is finished it can be brought very accurately to any desired composition.

If after a few hours' run this charge is found not to be just what is wanted, it can be corrected immediately. Three of the 24 unloading bins can be reserved for this purpose, with 125 tons of silicious or iron ore or lime-rock in each. One of these bins will make a variation of $1\frac{1}{2}\%$ in a whole bed and its contents can be put on the bed in 30 minutes. If a larger variation is required it may be applied to part of the bed in front of the reclaiming machine and the remainder of the bed adjusted at leisure. One hundred and twenty-five tons added to 125 ft. of bed will make a change of 5% in 30 minutes and will run the plant for 40 hours.

The supply from the beds to the furnaces will be accomplished by operations of the simplest character. The reclaimer operator has only to adjust the speed of travel of the machine along its track to suit the average rate of running of the furnaces. In other words, his only duty is to keep the receiving bins supplied. He will be guided in this by an occasional signal from the operator on the feed-floor.

The total cost of operation can be closely estimated in advance for any given local conditions. The system is in use as a whole or in part in several smelters and aside from this, there are ample data with which to estimate the cost of conveying on belts. It may be said that the total cost of handling from the unloading bins into the smelting column will generally amount to from 5 to 7 cents per ton. This includes labor, power, belt-renewals, and other repairs. The cost of unloading cars is to be added, and will, of course, depend on the kind of cars in which the material is received and on other matters. On account of the fact that all of the unloading is done at one place where the best facilities can be provided, it will generally be true that with this system the cost of unloading will be lower than with other methods. Cars will usually be released more promptly and switch engine service reduced.

The metallurgical advantages are largely the direct and indirect results of the following:

1. Extreme accuracy and uniformity in the composition and physical character of the charge.
2. Thorough and intimate mixture of the charge.
3. Close control of the disposition of material in the charge-car and furnace and uniformity of same practically independent of skill or diligence of operator.

The first of these advantages results from the action of the ore-bedding tripper, which travels on its forward stroke at a speed of 500 ft. per min. and on the return stroke 250 ft. per min. A round trip over a bed 500 ft. long consequently takes three minutes. With ore coming to the bed at the rate of 240 tons per hr., or 8,000 lb. per min., we have 24,000 lb. deposited during each trip. This amounts to 48 lb. per linear foot of bed. Now a given lot will not generally make an even number of layers, so that there will be an overlapping of layers on the bed, and the result will be that any particular linear foot of bed may receive too much or too little to an amount ranging from nothing to 48 lb. The average plus or minus error will thus be 24 lb. on any foot of bed for any one lot. Each foot of bed contains 10,000 lb., so that even if the lot in question were 100% SiO_2 for instance, the error in the percentage of that component would be only 0.06%. These errors are not only small but they are compensating in every sense. They will not conceivably occur constantly in one place in the bed, and if they did, their alternatively plus and minus character would tend to neutralize them. Even if they were all plus or all minus and recurred constantly at the same part of the bed, they would apply to the iron and lime as well as the

silica and the net result would be an infinitesimal variation in the analysis of the bed.

The thorough admixture of the charge results from nature of the bed and the action of the reclaiming machine. The triangular moving harrow on the front of the machine is set at such an angle (adjustable at any time while running), that every lump or particle agitated by it rolls down the slope to the conveyor part of the machine. The machine advances into the bed at the almost imperceptible rate of $\frac{1}{8}$ in. per min., so that at any instant an extremely small quantity is being taken from every part of the cross-section of the bed in an absolutely continuous manner. Everything is combined on the bottom plate of the machine, with no possibility of any preference being given to any portion. If all the lime is at the bottom of the bed, and all the silica at the top, and all the coarse at the edges, the result will not be affected in the slightest degree, for when the machine has advanced a foot or an inch, everything there was in that length of bed will have been removed and mixed.

Of course, the accomplishment of these things is purely relative. They are accomplished to some degree in every smelting plant. In all other methods of handling the charge in practical use today, however, the approach to perfection in these matters is limited at a certain point by absolutely impassable barriers. What is claimed for the method under consideration, is the removal of these barriers, without introducing others, making possible an approach to perfection so close as to promise a remarkable improvement in furnace performance over what is now the best.

Some of the limitations here referred to are:

1. The running out of bins or small storage units.
 2. The variation, chemical or physical, in different parts of the same bin.
 3. The limitations of the usual bedding operations in which the thickness of the layers must be determined by estimation.
 4. The irregular caving of the face of the bed.
 5. The practical limitation of the accuracy of weighing small quantities separately in making up the charge.
 6. The practical limit to the amount of work that can be done in the mixing of the charge and in the placing of it in the furnace or the charge car.
 7. The limit to the uniformity with which workmen can be made to do the above, regardless of the amount of time allowed.
 8. With charge containing material of all sizes, the impossibility of creating a desirable gradation of coarse and fine from the centre to the walls of the furnace without danger of separating one ingredient from another.
- Even if it were not possible to observe the above directly and in detail, the proof of the importance of irregularities resulting from the handling of the charge is forthcoming from the furnace itself. With the same blast, the same water circulation, and regular tapping, a variety of undesirable conditions arise which can be traced only to irregularities in the charge or in the feeding. Sometimes these are more or less directly traceable to wall accretions. But these accretions themselves must generally be due to local or temporary occurrences of abnormal charge which forms a material which prefers to affix itself to the walls of the shaft rather than run out at the tap-hole. The charge is here spoken of as including the fuel, and abnormal charge would in this sense be produced by misplacement of fuel. The shaft accretions or other irregularities of the furnace may at times be traced to abnormal conditions in front of the tuyeres. But all of the tuyeres receive the same blast and if variation in the charge is not causing differences in the crust on the jackets the latter will all be of the

same temperature. Again, we are generally forced to look to the existence of an abnormal charge above the tuyeres, producing material of different fusibility or different temperatures in front of them, in order to explain differences in the conditions at the tuyeres. Of course, leaks or derangement of blast or water supply or tuyeres full of slag are competent to produce irregularity, but these are things which are capable of being almost entirely eliminated.

Even where the slag analysis agrees closely with calculation from the charge, there may be, and probably generally are, parts of the smelting column containing a disadvantageous proportion of silica, lime, fuel, or other ingredient; these parts smelt at the best efficiency they can, while the slags mix in the crucible and in their combined analysis give no clue to the local irregularities within the furnace, due to the imperfection of the mixture.

In short, although the work at any particular plant may be of the highest order, still with the proposed system, the probability is that there will be a radical improvement in furnace speed, a practical elimination of excessive accretions, and a general perfection of metallurgical work hitherto unattainable.

RHODESIAN DEVELOPMENT.—The expansion of the gold industry in Rhodesia to the annual production of \$10,000,000 has been accomplished by the small investor and individual effort rather than by means of capital. Small reefs have been discovered in this territory, and many are confidently predicting that Rhodesia in a few years may perhaps excel the Transvaal in the production of the precious metals. Small operators with little capital by their own efforts have of late been extracting nearly one-third of the total amount of gold found, and their earnings have been spent mostly in the colony, as a consequence of which there has been a revival of trade. Rhodesia's output of minerals other than gold has increased and several new industries have come into life during the year. Pioneer settlers along the Cape to Cairo railroad have proved that what could be done in South Africa could also be done farther north, and some remarkable crops have been grown. The Kafue river, the bridging of which was an engineering feat only second to that accomplished at the Victoria falls, afterward proved to be a useful waterway, for it extends 100 miles, and several steam and sailing crafts have already been put on it. The close of 1906 saw the launching of a great scheme for the supply of electricity for the Rand, and Rhodesia is interested in this from the fact that it is the intention to derive a vast amount of that power from the Victoria falls.

IRON INDUSTRY IN CANADA.—A group of iron manufacturers at Erie, Pa., have established the Manitoba Iron Rolling Mills Co. at Winnipeg, Canada. The mill and the puddling furnace are now in operation, using large quantities of scrap iron. It is the only iron mill in Canada between Port Arthur and the Pacific coast. Another new plant has gone into service at Port Arthur, which is using exclusively Manitoba ore. This mill is paid a bounty of \$2.10 per ton by the Canadian Government. Mills which use American ores receive a bounty of \$1.10 per ton. At the present time the Dominion Government is paying bounties at the rate of nearly \$3,000,000 per year on the production of iron and steel. The total capacity of the Canadian blast-furnaces in the active list is 2,235 tons per day; the capacity of the furnaces now planned or under construction is 1,100 tons per day. There is no plant in Canada yet at which ship-plates and the larger sizes of structural steel are made.

Decisions Relating to Mining.

Specially reported for the MINING AND SCIENTIFIC PRESS.

A conveyance by an owner of land of the undivided half interest of the coal under the land, which was executed after a conveyance of the other half of the coal thereunder, operated as a severance of the coal from the land, so that thereafter the mere possession of the surface did not extend to the possession of the coal; and the holder of the paper title to the coal was entitled to recover in ejectment against the owner of the land, unless the latter and those under whom he claimed title had been in the adverse possession of the coal as such, independent of the possession of the surface, for more than ten years before the beginning of the action.

Gordon v. Park, (Mo.) 100 S. W. 621. (March, '07.)

The liability imposed upon mine owners by the Illinois mining act, of responsibility for the defaults of mine managers and mine examiners, who are required by that act to be selected by the mine owners from those holding licenses issued by the State mining board, created by such act, does not deprive them of their property without due process of law, where it is not obligatory upon any mine owner to select a particular mine examiner, or to retain one after selection, if found to be incompetent.

Wilmington Star Min. Co. v. Fulton, 21 Sup. Ct. 412. (March, '07.)

The statute selecting mine owners as a class upon which to impose liability and responsibility for the defaults of mine managers and mine examiners required to be selected from those holding licenses issued by the State mining board, is not repugnant to the constitution as denying the equal protection of the law.

Wilmington Star Min. Co. v. Fulton, 21 Sup. Ct. 412. (March, '07.)

Where the drilling out of unexploded charges was shown to be highly dangerous, and in the proper conduct of mining should never be done, it was held to be negligence of the company for its superintendent to direct an inexperienced miner, without instruction, to drill out an unexploded charge by reason of which he was injured.

Peters v. George, 154 Fed. 634, May, '07.

A mine owner may adopt a rule prohibiting persons who have left his employ from entering his mine; and such rule is reasonable although adopted for the purpose of keeping striking miners out of the mine, and though it prohibits them from entering the mine for their tools.

Sloss Iron Co. v. Prior (Ala.), 44 So. 649, July, '07.

Mining houses and machinery erected with the intention that they should remain and become a part of the real estate, are fixtures.

Hoye Coal Co. v. Colvin, (Ark.) 104 S. W. 207, July, '07.

Under a statute giving a laborer a lien on an output of a mine and on machinery, tools, and implements used in a mine, a miner employed by a non-resident lessee could not establish a lien against the mine and machinery and tools without proving a valid debt against the lessees.

Hoye Coal Co. v. Colvin, (Ark.) 104 S. W. 207, July, '07.

Where different owners of a mine united in working it without any agreement, the act of working together created a partnership.

Kirchner v. Smith, (W. Va.) 58 So. 614, Feb. '07.

An action for contribution by one partner in a mine for money paid for the partnership in the prosecution of mining may be retained by the court on the docket for further decrees against the defaulting partners.

Kirchner v. Smith, (W. Va.) 58 So. 614, Feb. '07.

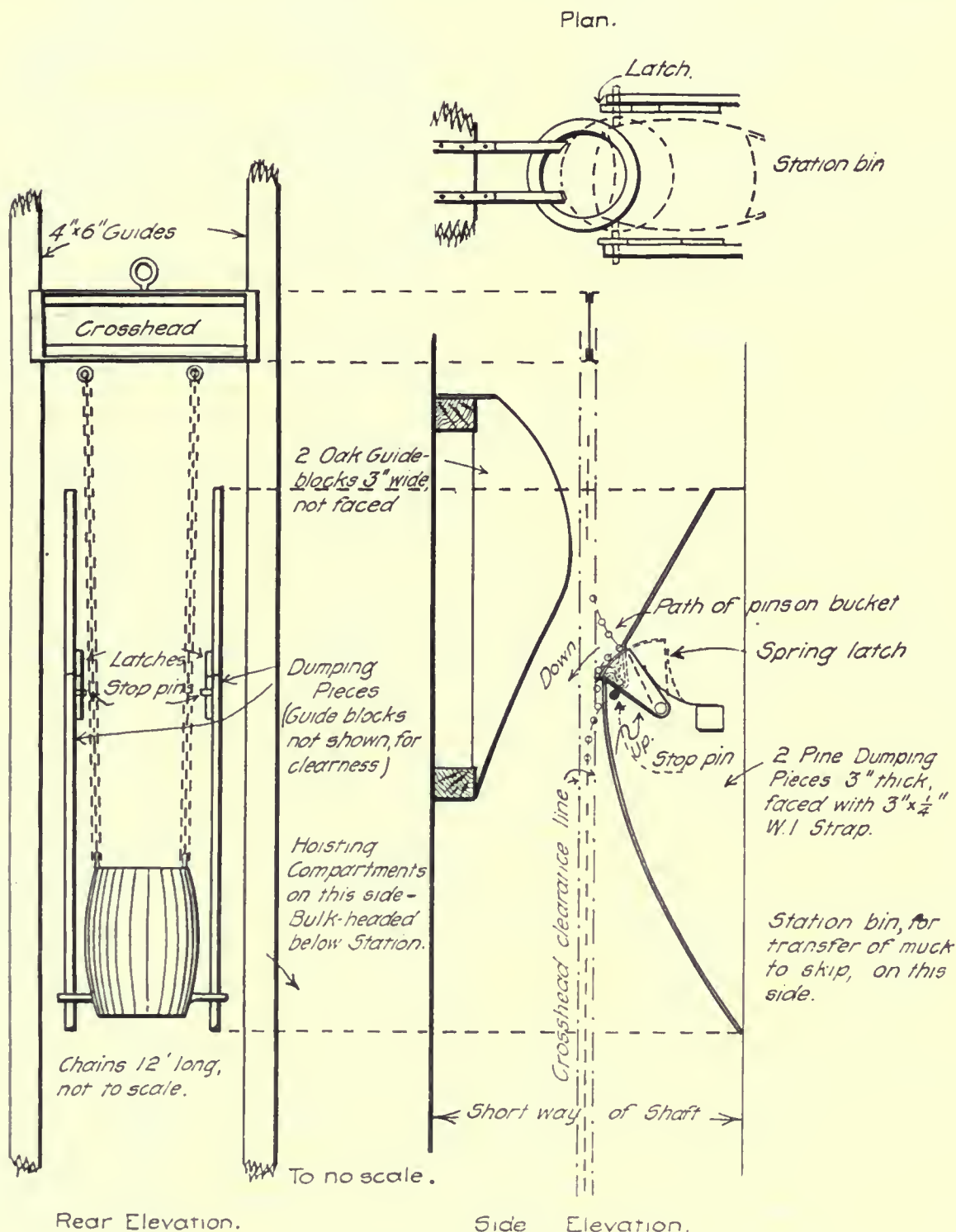
Arrangement for Dumping Buckets.

Written for the MINING AND SCIENTIFIC PRESS
By H. N. HERRICK.

The arrangement to be described is similar in principle to that published by Mr. F. S. Beckett in the MINING AND SCIENTIFIC PRESS of October 5. It is a device used

into a bin, whence it is drawn out from time to time by the skips through a convenient chute.

The bucket used is of the usual form, of curved sheet steel, with projecting 1-in. pins riveted to patches near the bottom, and is hung by 12-ft. chains to a crosshead raised on 4 by 6 in. wooden guides by a 15-hp. compressed-air hoist at the station. The chains are only long



Arrangement for Dumping Buckets.

at the Standard mine of the Federal Mining & Smelting Co. at Mace, Idaho, for shaft-sinking, and the details of it were worked out by Mr. R. S. Pascoe, superintendent of the Standard. The arrangement is used for hoisting from the bottom to the lowest level, in the compartment used above for pipes and wiring, the regular hoisting compartments being provided with heavy bulkheads to catch droppings from overloaded skips in the usual way. At the station the rock is dumped by the automatic device

enough to let the bucket reach the bottom without danger of getting the crosshead below the timber.

It would seem that a crosshead is absolutely necessary for a device of this sort if it is to be automatic to any degree, as without it the pins on the bucket would never come fair with the catches for dumping, due to the twist of the cable. On account of the use of the crosshead, the curved dumping pieces cannot go out to, and beyond, the line of action of the cable, as in Mr. Beckett's design;

the deflecting guide-pieces shown opposite to them have to be used in this case, to push the bucket enough to keep the pins against the dumping-piece, and to keep the bucket overbalanced toward the bin.

In use, the bucket is raised until the pins on the bucket are heard to drop into the catches on the dumping-piece, when it is lowered and empties into the bin. It is then raised until the spring-latches slide past the pins and backsnap against their stops, when the bucket is again lowered, and the pins slide along the curved upper surfaces of the latches, which prevent their entering the dumping-catches from above.

The pump-man at the station acts as engineer, and the scheme works smoothly and surely, with no attention whatever. I should think that some such spring-latch would be a good addition to Mr. Beckett's arrangement, but I do not know whether it is patented or not. A couple of 60-penny nails, an empty candle box, and a couple of strong rubber bands of the catapult variety should furnish ample materials.

Vanadium in the United States.

Vanadium, one of the rare metals, is used principally for hardening steel, especially in connection with chromium. The addition of a very small quantity of vanadium to chrome steel greatly increases its tensile strength, affording a steel that is much used in the axles and other parts of the higher priced automobiles, as well as for the stronger parts of other machines.

Roscoelite, a vanadium mica, occurs in commercially valuable deposits in southwestern Colorado, where it was mined and reduced in 1906. The ore contains about 2% of the metal. The product, an iron-vanadium compound, is shipped from the reduction plant at Newmire to Niagara Falls, and smelted by electricity to a ferro-vanadium containing about 25% vanadium, and selling for \$5 per pound of the contained vanadium. Another Colorado plant, at Cedar, produces vanadium as a by-product in the concentration of carnotite ores, about 20% of the concentrate being vanadium oxide. Vanadinite and other ores of the metal are found in small quantities in Colorado and Utah, as well as in the Southwestern States.

Vanadium salts are used in medicine, in ink and dye making, in coloring glass, and in chemistry. Vanadic acid is used as a pigment, affording a golden bronze that is very little inferior to true gold bronze.

GEMS IN THE TRANSVAAL.—The diamond industry of the Transvaal is a growing one and depends chiefly upon the Premier diamond mine, which has produced about \$17,500,000 worth of stones since the commencement of operations in December, 1902, and contributes about \$800,000 monthly to the diamond returns. Several diggings on the Vaal river contribute a number of stones during the year, but the river digging output is erratic, and the working population of the alluvial fields varies a great deal. Quite recently some excellent stones have been discovered upon a private farm near the Rhodesian border, and the extent of the alluvial wash at this spot promises well for a future output of excellent quality stones. A few small rubies have been found in gem-bearing washes in the northern Transvaal, but as yet no ruby fields have been made of sufficient importance to warrant throwing open any of the diggings to individual diggers. The diamond output for the year ending June 30, 1906, was 758,496.21 carats, valued at \$4,341,145, of which by far the greater portion was contributed by the Premier company.

The Prospector.

Enquiries sent to this department are answered free of charge, submitted by subscribers who are not in arrears. The full name and post-office address of the sender must be given, otherwise no answer will be made. Those who are not subscribers must accompany their questions with a fee of \$3 for each question. No assays are made.

Both specimens sent by E. C. D. M., Pioche, Nev., are Barite, the sulphate of barium.

A specimen of yellow Garnet containing black Hematite was received from D. G., of Terrazas, Mexico.

The rock from C. H. W., of Grizzly Flats, is Diabase. The three specimens sent previously have not been received.

The specimen from Iron Springs, Idaho, marked C. S. McM. are: No. 1, Soapstone; No. 2, Chalcopyrite in a quartz-feldspar rock; No. 3, Quartz with Hematite; No. 4, kaolinized rock; No. 5, Limonite.

The rocks from San Simon, Ariz., marked H. A., are all of the same general type of volcanics, probably rhyolite or quartz-porphry, some of which has been mineralized with pyrite.

From Eckley, Ore., marked E. S. W., come: No. 1, Hornblende and Quartz; No. 2, Chromite; No. 3, silicious Limonite; No. 4, Quartz with Pyrite and Sphalerite; No. 5, metamorphic rock with Pyrite and Calcite; No. 6, Graphite and Pyrite; No. 7, Quartz with Pyrite.

L. I. T., of Gleeson, Ariz., sends: No. 1, rock stained with Cuprite and Malachite; No. 2, altered rock, perhaps a Rhyolite, stained with Hematite; No. 3, rock with red Hematite, formed from the oxidation of the pyrite; No. 5, cherty Rhyolite with Hematite.

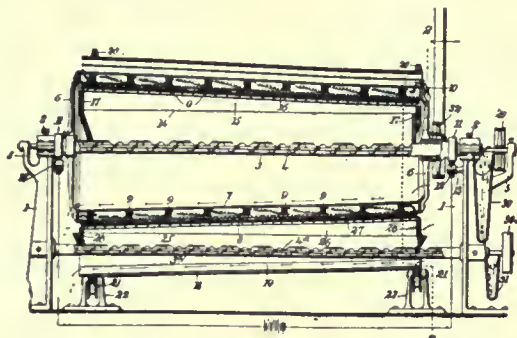
DIAMONDS IN NEW SOUTH WALES.—The more recent and more important diamond districts around Bingara and Inverell are situated near the Queensland border. Bingara is 378 miles north of Sydney, and Inverell and Tingha are both nearly 40 miles east of Bingara. The divisions named from the two latter places contain much tin in the drift, while the Bingara division is worked principally for gold. With regard to diamonds in particular near Copeton, in the Inverell district, are numerous isolated hills capped with basalt, beneath which are sands and gravels, with tin, diamonds, and some gold. These hills have been variously named, one of them being the celebrated diamond locality of Boggy Camp. It was in this district that the discovery of two small diamonds in a basaltic dike was made in 1904, at Oakey creek, near Copeton. The Bingara division presents conditions somewhat similar, yet with some differences. The chief diamond yield has been from patches of gravel capping the foothills of the basalt covered range some five miles to the southwest of Bingara. It is in the Bingara district, at Ruby hill, that the eclogite-bearing pipe was observed in 1902, which led to so much discussion as to eclogite being the probable source of the diamonds. There has been but little activity of late in these fields owing to low prices for the diamonds, which are all of small size.

TRANSVAAL COAL.—The Transvaal is exceptionally fortunate in having large supplies of easily worked medium quality coal, which can be delivered at the mines in bulk, and is one of the most important features in cheapening the cost of working the low-grade ores of the Witwatersrand.

MINING AND METALLURGICAL PATENTS.

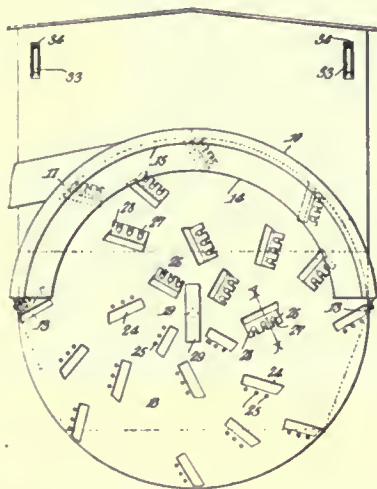
Specially Reported for the MINING AND SCIENTIFIC PRESS.

MAGNETIC SEPARATOR.—No. 867,744; James B. McCabe, Buffalo, New York.



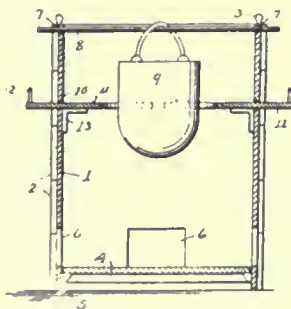
A magnetic separator comprising a drum having inner and outer magnetic surfaces adapted to serve independently in the separation of magnetic from non-magnetic particles, and means for detaching the magnetic particles from said surfaces.

DREDGING-MACHINE.—No. 867,788; George M. Brown, Tacoma, Washington.



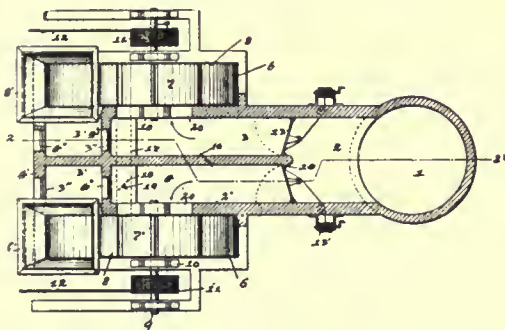
In an apparatus of the character described, the combination with a floating structure, of a rotary cutter-head at one end of said structure, the diameter of said cutter-head being greater than the width or draft of the structure, and an adjustable hood supported above the cutter-head.

MELTING-FURNACE.—No. 867,781; Thomas D. Bausher, Reading, Pennsylvania.



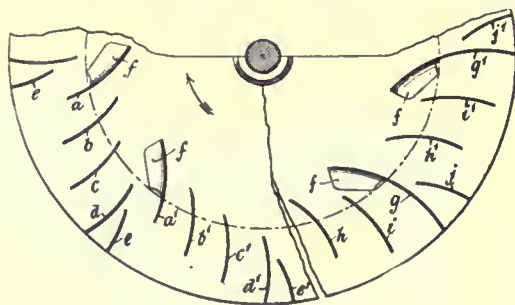
In a knock down melting-furnace, a rectangular body comprising four vertical walls, each of which is formed with interlocking hinge members, pins for securing together said members, a removable floor, a door in each of said wall members in line with said floor, two oppositely disposed, horizontally sliding dampers, said dampers having their inner edges concave and provided with handles at their outer ends, a movable supporting rod and a melting pot supported by said rod and depending below the line of said dampers.

SYSTEM FOR VENTILATING MINES, ETC.—No. 867,791; George M. Capell, Passenheim, England.



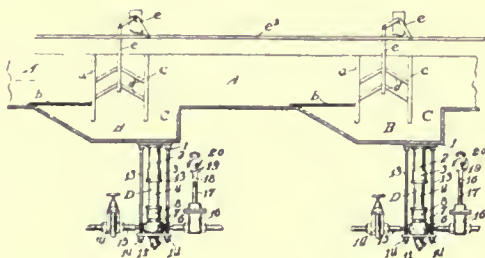
In a system for ventilating mines, etc., the combination of two air drifts leading from the mine, a fan connected to each of said drifts, and a main passage-way connected to and between said drifts for equalizing the pressure of air within said drifts.

CENTRIFUGAL FAN AND PUMP-WHEEL.—No. 867,874; George M. Capell, near Stony Stratford, England.



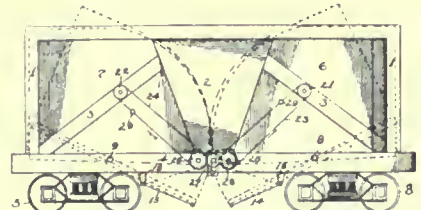
A centrifugal wheel for circulating fluids, having a series of vanes extending inwardly from the periphery and blades back of the vanes, each such blade extending inwardly toward its vane and at a greater angle from the radius than such vane, said wheel having an opening at or near the inner end of the blade leading into the space between the blade and vane.

HYDRAULIC CLASSIFIER FOR ORES.—No. 866,536; Seth R. Swain, Denver, Colorado.



The combination with a trough having a pocket therein, a fixed and movable baffle board in said pocket, the latter movable bodily to one side, means for adjusting the movable baffle board, and a screen extending from one end of the pocket to the fixed baffle board.

DUMPING-CAR.—No. 867,726; Maurice P. Henvis and Daniel S. Clark, Norfolk, Virginia.



A dump car comprising a braced frame, hoppers supported by said frame, said hoppers having curved ends, and sliding bottom extensions to said hoppers. A dump car comprising a frame, of hoppers pivoted to said frame, a bottom for said hoppers having a sliding extension thereto.

A Centrifugal Roller Quartz Mill with Central Feed.

The patentee, L. C. Graupner, was formerly engaged in selling Huntington mills, and during a period of 15 years he had his attention called to the defects of these mills as then made, and this led him to invent the improvements noted herewith.

The machine has a central feed which discharges the ore through four openings (in the central cone) to be evenly distributed by the scrapers, so that the rollers will crush an equal amount of ore at all parts of the die-ring, thereby increasing the capacity of the mill and insuring an equal amount of wear around the entire face of the die.

The die-ring sets into the pan without the use of wooden wedges. In this mill the die-ring is tapered, and is fitted into the pan, the wall of which has an equal taper, so that when the ring is driven down to place, the die and pan bottom are as one piece, which forms a solid anvil for the rolls to crush against, and permits wearing the die down very thin so that little of the steel is lost or need to be thrown away. The die is easily set and always comes to a perfect centre.

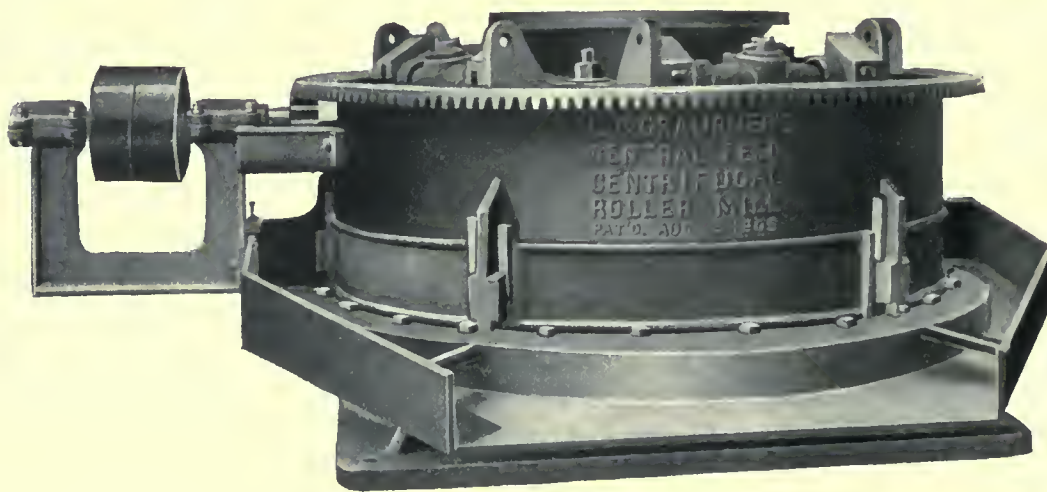
Roller rings are secured to the roller-head without the

on the bottom edge has a tongue which fits into a groove in the pan bottom, so that only a small packing is required in the bottom of the groove to make the joint perfectly water-tight.

Commercial Paragraphs.

THE AMERICAN LOCOMOTIVE WORKS, of New York, report the following orders: Two standard gauge 6-wheel tank engines for the Fo-Kien Ry. Co. of China; one compound steam-motor car for the Chicago, Rock Island & Pacific Ry.; 125 locomotives for the Harriman lines, made up as follows: 30 Mogul type, 10 Atlantic type, 43 Consolidation type, 24 10-wheel type, and 18 6-wheel switching locomotives.

THE DENVER ENGINEERING WORKS CO. is preparing to ship what is believed to be the largest electric mining-hoist ever made for installation in the United States. This machine will be installed by the Nevada Con. Copper Co. at Ely, Nevada. The hoist will weigh, without electric apparatus, 55 tons, and the electric apparatus will weigh approximately 20 tons. It will require five cars to make the shipment. Round rope will be used on the drums. The machine is of the double-drum type. Another machine of



use of wedges. In this mill the rings are tapered on the inner side, from the centre to the edges, and are securely held in place between the roller-head and its follow-ring, making it impossible for the ring to become loose, and permitting the wearing of the ring to a thin shell, thus saving steel and also delivering the full force during the entire life of the rings. The rings are easily and quickly changed and will come to a perfect centre as the bolts are screwed down. The removable splash-ring can be replaced when worn out, thus avoiding the throwing away of the entire housing when the splash-curb is worn away. The removing of the splash-ring also leaves more room in the mill when cleaning up or making repairs.

The main driving gear rests upon a large ball-bearing, having balls $1\frac{1}{2}$ in. diam. and race-rings of large diameter, distributing the weight of the gear around the central cone, to which the race-rings are secured. This ball-bearing takes the place of the old-time central shaft, its heavy bearings and large driving pulley. The pulley frame has a small tight and loose pulley for driving the mill and ore-feeder, which requires only a four-inch belt to drive the largest mill. The pulley-frame is so arranged that it can be removed and a pedestal put in its place to receive an electric motor for direct connection.

The mill is so arranged that all the working parts, together with the splash-ring, can be hoisted out of the pan and housing without the loosening of any bolts or other parts, thus enabling the operator to clean up the mill in the shortest possible length of time. The mercury well is placed so that there is no projection below the bottom of the mill, leaving the bottom smooth so that rollers can be used in moving the mill to position and the mill will set fairly on a smooth foundation. The housing is cast in one piece, and

the same size will be ready for shipment in about three weeks to another mine in the Ely district.

THE KELLY FILTER PRESS CO., of Salt Lake, owning the patents on the Kelly filter-press, are installing one of their 50-ton units in the cyanide plant at Pearl, Idaho. This is the second 50-ton unit of this type they have installed during the past few months. One of their machines is in use at Cripple Creek, Colorado. Their catalogue, which describes the machine fully, is ready for distribution and will be mailed upon request.

THE A. S. CAMERON STEAM PUMP WORKS, of New York, are using their Slogan with such good effect in their advertising literature and trade paper publicity, that it long ago became well known to the trade and to users generally. This company also adopted the motto, "Character; The Grandest Thing," because it was the character of their product that made the Cameron reputation. This principle is embodied in the manufacture of every pump that is produced from their works. All Cameron pumps are marked with the Cameron symbol and trade mark: The Acorn.

Catalogues Received.

'Report of the Department of Mines, West Australia, for the year 1906,' Government Printer, Perth, West Australia.

'Papers and Reports Relating to Minerals and Mining,' Government Printer, Wellington, New Zealand.

The Clason Map Co., of Denver, send a copy of their new map of the Bullfrog district. Retail price, 50 cents.

We have received from the United States Geological Survey 'Bulletin No. 313; The Granites of Maine,' by T. Nelson Dale.

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TABLE OF CONTENTS

Editorial:	Page.
Notes.....	537
On the Margin.....	538
Copper Statistics.....	538
Gold and Silver Production.....	539
General Mining News.....	541
Special Correspondence.....	546
London.....	Denver, Colorado
Mexico City.....	Salt Lake, Utah
Butte, Montana.....	Toronto, Canada
Concentrates.....	556
Discussion:	
Capitalization of Rand Mines.....	Thos. H. Leggett 551
Professional Customs.....	Benj. B. Lawrence,
F. Lynwood Garrison, Alex. Roy, F. W. B.,	
R. B. Symington.....	551
Slag-Dams.....	Hiram W. Hixon 553
Articles:	
Notes on Tube-Mills.....	J. Kennedy 555
Jigging by Hand.....	Arthur C. Nahl 557
Uranium.....	560
Compressed Air in Cyanidation.....	560
To Young Men About to Become Mining Engineers.....	Courtenay De Kalb 561
Titanium.....	564
Departments:	
Personal.....	540
Market Reports.....	540

Editorial.

WE ARE GLAD to note that both the Allis Chalmers Company and the Westinghouse Electric & Manufacturing Company have been able to give reassuring statements concerning their affairs. The former reports a considerable gain in profits and the proximate completion of important enlargements in its manufacturing plant, while the Westinghouse company, although temporarily operated under a receivership, is in a position to fill orders and to conduct business as usual.

IT IS RUMORED circumstantially that the Amalgamated people have obtained control of the American Smelting & Refining Company, owing to financial difficulties in which the Guggenheims have become involved. We hope this proves to be untrue. The Guggenheims are not philanthropists exactly but they are much to be preferred to the predatory financiers of the Amalgamated and Standard Oil companies. Besides, the Standard Oil group controls enough; any extension of their power over the mining industry would be highly detrimental.

A RECENT QUERY in regard to the making of a dam with slag has elicited a most valuable bit of information from Mr. Hiram W. Hixon, the metallurgist responsible for the dam at East Helena. Mr. Hixon is now manager of an important smelter in Canada, but he has left an enduring monument to his ingenuity in the shape of the slag-dam in Montana. He is a keen disputant in matters relating to ore deposits, and it is fair to say that if he knows as much about igneous processes in the past as he does concerning those controlled by man, his views on a burning question must be received as authoritative.

ON ANOTHER PAGE we publish the advice given by Mr. Courtenay De Kalb on the occasion of a recent informal address to the senior class in the College of Mining at the University of California. While intended for the inexperienced, it will also interest those who have served their apprenticeship, for it will recall some of their own troubles, blunders, and successes. It is based on the facts of life at the mine and mill, and for that reason it bites into the intelligence of the reader, as it did into the alert minds of those that were listeners. We direct attention to a lucidity of statement and a manner of expression that mark the scholar and the scientist; Mr. De Kalb speaks in terms that fit and in similes that illuminate. As for the matter, comment is supererogatory. One point only we venture to emphasize, and that is the advice to pay attention, first and foremost, to the mine itself, as distinguished from the administration at surface and the work of the mill. The American mining engineer is especially capable as a

mill manager, as an administrator of business affairs, and as a mechanical engineer; when he fails, it is usually in the actual work of mining, that is, finding ore and extracting it cheaply. That part of his duties is left too much to the supervision of Irish shift-bosses, Cornish foremen, and intelligent Finns. Directors of mining companies and mine operators in general are unable to recognize good or bad underground management, while they do appreciate nice maps, a beautiful mill, systematic accounts, etc. And yet it is underground that a mine is made or marred. Apart from the cost of breaking ore and sending it to surface, the finding of new orebodies or the care not to lose the traces of those already discovered is a decisive factor in making a mine successful. To do this, there is only one way and that is to go underground and become familiar with the workings, the characteristics of the deposits, and the conditions that affect the distribution of ore in the rock. To be a miner, go underground.

THERE MUST be many places where jigging by hand can be applied profitably, especially in the more remote parts of Mexico. Mr. Arthur C. Nahl's description of the jigs designed by him at Trinnfo will be useful to many superintendents of mines. For it happens often that the amount of ore suitable for jigging, say, in an old dump, will not justify the investment of capital in expensive machinery, while it will warrant such an apparatus as is described elsewhere in this issue. Such machines can be made by a company and distributed to the tributers or *gambucinos* on a royalty, with results profitable to all concerned. It is likely that among the abandoned mines or *antiguas* of Mexico, there are dumps capable of yielding a profit if jigged by hand, while the old workings are being re-opened.

On the Margin.

AMONG the after-effects of the recent collapse of credit at New York and Pittsburg, there has been a sort of house-cleaning on the part of the exchanges and banks. Certain undesirables have been practically driven out of business and the force of public opinion has been recognized to such an extent that the gamblers have promised to reform. It is interesting to read that during this convalescence of a sickly credit system the banks "frown upon marginal operations in stocks" and a hint to that effect "has been conveyed to stockbrokers in terms not to be misunderstood." This brings forward a subject concerning which we hold a decided opinion, and it is an opinion shared by many others capable of viewing speculation in stocks with some degree of mental detachment. Why should trading on a margin be permitted at any time? Why should the banking authorities "frown" upon the practice only at a time like this? Is it only theorists and dreamers that consider it wrong to sell what you do not own and buy what you have not money enough to pay for? A man puts up a margin of 20 per cent and sells your stock, expecting that you will have to sell it for a lower price, or he buys your stock in the expectation that you will be glad to dispose of it on a ris-

ing market to some third person. As a matter of fact if you sit tight, his operations will not affect you, and it is mainly another gambler betting on the opposite side that contributes the other side of the game. For a game it is—not business nor industry—no better essentially than betting on horses or cards or the black and red. And is it anybody's business whether these gamblers bet on stocks or on cards? Yes. Because by their reference to the property of other people as an excuse for their betting, they disturb the valuation of such property. You want to sell your stock to get money for a business enterprise and you find that it is quoted much lower than when you purchased it, not because the earnings have decreased, but merely because one gambler or set of gamblers has been betting that it will go down and has got the best of the other fellow or the other clique, who were betting that it would go up. You want to invest your savings and you turn to railroad stocks or mining shares as quoted on the Exchange, the legitimate office of which is to afford facilities for the 'exchange' of property in money, stocks, and bonds. You find that you cannot get a safe investment except at a preposterous price, yielding an extremely low rate of interest. Why? Because the gamblers have been playing with the stock and others like it, so that it has been given a fictitious value, which is usually too high, because the professionals make their money by selling—to the public. If trading on a margin were prohibited, all the active stocks would drop 20 to 35 per cent even below their present low prices, and the result would be that the actual investor—everyone and anyone except those who make money by betting on the fluctuations—would be able to get securities yielding him 8 to 12 per cent, instead of the usual 4 to 5 per cent obtainable on first-class stocks at the usual inflated prices. Here in San Francisco during the days of the Comstock, the servant girls and cooks who "played the stock market" were called 'mud hens' because they dabbled on the margin. To us the gentlemen on whom the banks, for a few minutes, are "frowning" might well be called *zapilotes*.

Copper Statistics.

"THERE are three kinds of lies: lies, damned lies, and statistics." So said Disraeli. We concur. And statistics are particularly likely to mislead when they are taken too seriously. Thus our contemporary at New York falls foul of the Geological Survey and points cheerfully to a serious error made in the statistics of copper as published by the bureau at Washington. The geologist in charge of copper statistics is, we understand, perfectly frank in acknowledging that he made a mistake in the output of Montana in 1906, the error arising through the neglect to include the copper produced at the Montana Ore Purchasing Co.'s works in the early part of the year and before that smelter was dismantled. Thus some 7,000,000 pounds of copper were overlooked. Meanwhile, the editor at New York, who is not unwilling to criticize the geologist at Washington, made an error in the Michigan figures, for he got his data from the State Commissioner of Mineral Statistics, who keeps

account of the copper in the ore produced at the mines. Mr. L. C. Graton of the Survey got the figures of copper actually smelted, and as the high price for the metal caused the smelters to use up old stocks of ore, his total for Michigan is higher than that of Mr. W. R. Ingalls, and more correct by just the difference, namely, 5,000,000 pounds. Finally, as regards the production of California, both statisticians were in error by about 4,000,000 pounds of copper, for both omitted to include the yield of three large mines, which contributed during 1906, and were overlooked because they were in separate districts not usually productive of copper.

It appears also that while one authority estimates that the rate of increase last year was 2.03 per cent, the other makes it 4.08, and we confess to believing that whichever

it be dubbed the science of the inexact. "You can prove almost anything by statistics"—so says the proverb—especially their inaccuracy.

Gold and Silver Production in the United States in 1906.

BY COURTESY of the Acting Director of the Mint, we are in receipt of the revised figures for the estimated production of the precious metals in the United States during the calendar year 1906. The total gold yield is estimated at \$94,373,800 as against \$96,101,400—the provisional estimate given out in January. At that time Nevada was credited with \$9,815,800; now it is put down for \$9,278,600. Arizona is estimated at \$500,000

PRODUCT OF GOLD AND SILVER IN THE UNITED STATES FOR THE CALENDAR YEAR 1906.

State or Territory.	Gold.		Silver.		Total value. (Silver at commercial value.)
	Fine ounces.	Value.	Fine ounces.	Commercial value.	
Alabama	1,137	\$ 23,500	100	\$ 68	\$ 23,568
Alaska.....	1,033,537	21,365,100	203,500	137,747	21,502,847
Arizona.....	132,891	2,747,100	2,969,200	2,009,822	4,756,922
California	911,041	18,832,900	1,517,500	1,027,180	19,860,080
Colorado	1,109,452	22,934,400	12,447,400	8,425,520	31,359,920
Georgia	1,146	23,700	300	203	23,903
Idaho	50,102	1,035,700	8,836,200	5,981,135	7,016,835
Michigan			186,100	125,969	125,969
Missouri.....			31,300	21,187	21,187
Montana	218,752	4,522,000	12,540,300	8,488,404	13,010,404
Nevada	448,852	9,278,600	5,207,600	3,524,972	12,803,572
New Mexico.....	12,877	266,200	453,400	306,902	573,102
North Carolina.....	4,397	90,900	24,700	16,719	107,619
Oregon	63,860	1,320,100	90,700	61,394	1,381,494
South Carolina.....	3,609	74,600	100	68	74,668
South Dakota.....	319,512	6,604,900	155,200	105,053	6,709,953
Tennessee	39	800	25,600	17,328	18,128
Texas	164	3,400	277,400	187,769	191,169
Utah	248,208	5,130,900	11,508,000	7,789,650	12,920,550
Virginia.....	498	10,300	100	68	10,368
Washington	4,983	103,000	42,100	28,497	131,497
Wyoming	276	5,700	1,100	745	6,445
Total.....	4,565,333	\$94,373,800	56,517,900	\$38,256,400	\$132,630,200

is right this year is likely to be wrong next year—which sounds ungenerous, but we mean that the tabulation of outputs is based upon compilations and outputs, the accuracy of which is never certain, simply because it comes at second-hand and from people often unwilling to be exact. We have knowledge of important data being given with the intention to mislead; they did not refer to copper, but they affected a total quite as impressive as the total production of that metal. To be a successful statistician requires the skill of a detective and luck, and then more luck. Therefore the public should not take statistics, nor statisticians, themselves, too seriously. They—the statistics, not the statisticians—are useful approximations, if timely, but only imposing inanities if overdue by a year or so, as has happened both at Washington and New York. On the other hand the statisticians—not the statistics—happen in this case to be men of unusual ability in other directions, in which their work is of special value. The training and experience of two gifted scientific men are diverted to a subject that by no stretch of imagination can be termed a science, except

less and the California figures are \$200,000 more. The silver statistics are practically unchanged as to the total, the difference being only 334,400 ounces more, but Montana is increased nearly a million ounces, and Colorado is credited with 200,000 ounces more, so that Montana now leads with a handsome margin. These comparisons simply indicate the difficulty of getting exact data and the chance of errors due to the complexity of the metallurgical operations, by which an ore is mined in one State, smelted to matte in another, reduced to metal in a third, and refined in a fourth. Eternal vigilance is the price of safety in statistical, as in other, work. The Mint figures show that Colorado leads the States in the production of the precious metals, with Alaska second. In gold production Colorado is first, with Alaska gaining every year, so that their relative positions are likely soon to be reversed. In silver Colorado, Montana, and Utah are now nearly equal, the first having lost the unquestioned leadership of the past twenty years. Other interesting features of the tabulated statement will suggest themselves to anyone willing to study the figures.

Personal.

JAMES W. NEILL is in Arizona.
W. C. RALSTON is at Washington.
GEORGE W. MAYNARD is at Tucson.
A. S. DWIGHT was at Cananea lately.
THOS. J. BARBOUR has gone to New York.
J. H. WEDDLE has returned from Honduras.
RICHARD A. PARKER is at Silverton, Colorado.
THOS. H. LEGGETT is on his way to New York.
WILLIAM MCM. HUFF is assayer at Kellogg, Idaho.
MAX BOEHMER, of Leadville, is at Goldfield, Nevada.
W. SPENCER HUTCHINSON, of Boston, has been at Butte lately.
PATRICK HOLLAND was in town from the Trinity county mines.
W. A. FARISH has been examining mines near Ely, Nevada.
A. E. BIDLAKE has left England to go to Erithrea, in Abyssinia.
CARL O. LINDBERG is at Mexico City, with CARPENTER & BRENNON.
ALGERNON DEL MAR has left Colorado and is now at Pasadena, California.
EDWARD H. BENJAMIN is directing dredging operations in Sacramento county.
EDWIN T. FIELD, manager of the United Elkhorn mines in Oregon, is at Chicago.
L. A. WOMBLE leaves San Francisco this week for Colombia, South America.
C. A. RICE is superintendent for the Providence Mining Co., at Webb City, Missouri.
J. MORGAN CLEMENTS is examining the Gold King mines at Silverton, Colorado.
THOS. A. VARDEN, of Sacramento, Cal., has been at Goldfield during the past week.
T. S. RODGERS, of Los Angeles, has returned from examining mines near Salome, in Arizona.
EMERSON GEE has returned to Reno, Nev., from examining gold mines in Sierra county, California.
ROBERT D. LUCE has been appointed superintendent of the Castle Dome mines, in Yuma county, Arizona.
E. H. GARTHWAITE gave an address on 'Rhodesia' to the mining students of the University of California.
S. W. MUDD has returned to Los Angeles from the Ray mine, in Arizona, of which he is consulting engineer.
A. R. PARSONS, superintendent of the Tonopah Mining Co.'s mill, has returned to Millers, Nevada, from a visit to Salt Lake.
JOHN B. GAFFEY, lately with the Bulaklala Co. at Coram, Cal., has accepted a position with the Oregon Smelting & Refinery Company.
E. F. LINES, of the U. S. Geological Survey, is spending the winter at Urbana, Illinois, in studying the clays of the coal measures in co-operation with the State Geological Survey.
G. H. ASHLEY, DAVID WHITE, and F. W. DEWOLF have been making a trip through the coalfields of Illinois, Indiana, and western Kentucky for the purpose of studying the correlation of the various coal beds.
G. S. RICE, for many years connected with the Colorado Fuel & Iron Co., the White Breast Fuel Co., and other coal mining companies, has arranged to devote his whole time to consulting work and has opened an office in the First National Bank Bdg., Chicago.
CLYDE T. GRISWOLD has entered upon his duties as professor of mining and metallurgy in Colorado College, Colorado Springs. Mr. Griswold is a graduate of Amherst College and of Columbia University, and was connected for some time with the Canadian Copper Co. as superintendent of their Crean Hill mine in Ontario.

Latest Market Reports.

LOCAL METAL PRICES—Oct. 31.

Antimony.....	13@17c	Quicksilver (flask).....	\$45.50
Copper scrap.....	16@17c	Spelter.....	7@ 7.75c
Pig Lead.....	4.85@ 5.80c	Tin.....	40½@42c

ANGLO-AMERICAN SHARES.

Cabled from London.

	Oct. 23.	Oct. 30.
	£. s. d.	£. s. d.
Camp Bird.....	0 18 0	0 17 0
El Oro.....	1 3 9	1 0 6
Esperanza.....	1 18 0	1 13 9 ex div.
Dolores.....	1 2 6	1 0 0
Oroville Dredging.....	0 14 9	0 14 6
Stratton's Independence.....	0 3 0	0 3 3
Tomboy.....	1 6 3	1 6 3

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.

Date	Electrolytic Copper	Lead	Spelter	Silver
" 25.....	117½	4	5.43	61
" 26.....	12¼	4	5.40	60¼
" 27.....	Sunday. No market.			
" 28.....	12¼	4	5.38	60½
" 29.....	13	4	5.38	59½
" 30.....	13¾	4	5.33	59½
" 31.....	14	4	5.33	59½

MINING STOCK QUOTATIONS—NEW YORK.

Closing Prices.

	Oct. 23.	Oct. 30.
Bingham Central.....	½	½
Boston Copper.....	107½	12¼
Cumberland Ely.....	4½	5¼
Dolores.....	5½	5
El Rayo.....	2	2¼
Guanajuato Con.....	2	2½
Glroux Con.....	3	3
Greene Cananea.....	5½	6¼
Nevada Con.....	6¼	7
Nipissing.....	57½	6
Tennessee Copper.....	19	21
Tonopah Ex.....	11½	1½
Tonopah-Belmont.....	1	1¼
Tonopah.....	8	8¼
United Copper.....	8	23½
Utah Copper.....	13	16½

(By courtesy of Hayden, Stone & Co., 25 Broad St., New York.)

SOUTHERN NEVADA STOCKS.

San Francisco, Oct. 31.

Atlanta.....	\$ 22	Laguna.....	80
Belmont.....	1.05	Manhattan Con.....	33
Columbia Mtn.....	18	Midway.....	47
Combination Fraction.....	83	Mizpah Extension.....	10
Daisy.....	63	Mohawk.....	8.12
Fairview Eagle.....	68	Montana Tonopah.....	1.50
Florence.....	2.20	Nevada Hills.....	3.25
Gold Bar (Bullfrog).....	33	Red Top.....	2.50
Goldfield Con.....	4.05	Sandstorm.....	17
Goldfield of Nevada.....	1.10	Silver Pick.....	24
Gold Kewanas.....	23	St. Ives.....	35
Great Bend.....	27	Tonopah Extension.....	1.10
Jim Butler.....	47	Tonopah of Nevada.....	8.00
Jumbo.....	2.50	Tramp Con.....	20
Jumbo Extension.....	68	West End.....	40

(By courtesy of W. C. Ralston, 368 Bush St.)

COPPER SHARES—BOSTON.

Closing prices.		Closing prices.	
Oct. 31.		Oct. 31.	
Adventure.....	1	Michigan.....	8½
Ahmeek.....	52	Mohawk.....	45
Allouez.....	22½	Nevada Con.....	6¼
Amalgamated.....	51½	North Butte.....	
Arcadian.....	3	Old Dominion.....	22
Atlantic.....	10	Osceola.....	80
Balaklala.....	4	Parrot.....	10½
Bingham Con.....	6¼	Phoenix.....	75
Boston Con.....		Quincy.....	78
Butte Coalition.....	15¾	Raven.....	
Calumet & Arizona.....	103	Rhode Island.....	2½
Calumet & Hecla.....	600	Santa Fe.....	2
Centennial.....	20½	Shannon.....	10½
Con. Mercur.....	25	Superior & Pittsburg.....	70
Copper Range.....	52	Tamarack.....	65
Daly-West.....	10½	Trinity.....	11½
Franklin.....	7½	United Copper com.....	7½
Granby.....	80	Utah Copper.....	16½
Greene-Cananea, ctf.....	6½	Victoria.....	4
Isle Royale.....	15	Winona.....	3¼
Mass.....	2¼	Wolverine.....	105

(By courtesy of E. F. Hutton & Co., 490 California St.)

General Mining News.

ARIZONA.

COCHISE COUNTY.

The Sacramento shaft of the Copper Queen is sunk to a depth of 1,200 ft. A drift is being driven from the Lowell shaft to connect with it at that depth. The Sacramento shaft will probably be the main hoisting shaft in the near future. A new power-house is being built at this shaft. No further reduction in the force at the Copper Queen mine is expected.—Considerable prospecting and development work is being done at the Calumet & Arizona and the Superior & Pittsburg properties.—The Shattuck is shipping 200 tons of sulphide ore to the Globe smelter. The oxidized ore is being piled on the dump owing to the refusal of the Copper Queen smelter to accept it. The orebody on the 600-ft. level is looking well.—The Denn-Arizona has stopped shipping but is developing the orebody on the 1,100-ft. level.—At present there is considerable mining activity in the Dragoon Mtn., north of Tucson, where many copper prospects are being developed with favorable results.

GILA COUNTY.

The Old Dominion company no longer works its mines Sundays and it is probable that the other companies at Globe will adopt the same policy. A week ago last Sunday the Dominion smelter made a record run when 770 bars of blister copper were turned out.—The Gibson mine on Pinto creek is still working 200 men; most of the development work is confined to the three-compartment shaft. This mine ships about 1,200 tons per month.—The two-compartment shaft at the Powers Gulch group on Pinto creek is down 69 ft. and will be continued to a depth of 250 ft.—A contract for a 300-ft. adit on the Grandstaff group has been let and the work is now progressing rapidly.—At the Arizona National mine development is being confined to the 125-ft. level in order to determine the strike of the big vein which was cut in the shaft at that level. The cross-cut adit is now 180 ft. long.—A flow of water has been struck in a drift on the 360-ft. level of the Calumet & Globe and it is thought that a pump will have to be installed to handle this flow. The Central and Union mines on upper Pinto creek have shut down.—The Gem shaft of the Globe Con. has reached a depth of 1,075 ft., but is to be sunk 125 ft. deeper before cross-cutting.—The Superior & Boston is actively developing its property. The mine is looking well.—Sinking has been resumed at the B shaft of the Old Dominion Co.; the C shaft is to be sunk another 200 ft. All the ground above the 9th level has been drained by the drift from A shaft on the 10th level so that water will not interfere much with this sinking. The winze from the 14th to the 16th level has been completed. The station on the 16th level is being cut. The A shaft is now 1,235 ft. deep.

GRAHAM COUNTY.

At the time that the slump in copper began, about 4,500 miners were employed in the Clifton-Morenci district; according to Clifton papers only about 500 men had been laid off up to last week.—Work has begun at the Bonita group in Lone Star district. Four teams are hauling machinery to the mine. Fifteen men are working at the property.—A 5-stamp mill will be erected at the Gold Belt group as soon as sufficient treasury stock can be sold to pay for it. The mine is looking well and considerable ore is on the dump.—The vein at the Buzzard Shadow claim of the New York-Arizona Co. appears to be widening, but as yet a depth of only about 20 ft. has been reached. At surface the vein was 12 in. wide, at 18 ft. it is 6 ft. wide.

MOHAVE COUNTY.

Considerable development work is planned for the P. K. and K. P. mines in I X L basin, belonging to the Arizona Lead Silver Co. The shaft will be sunk deeper and a cross-cut driven through the vein. At present the cross-cut is 60 ft. into the vein with no sign of the other wall. The lode is well mineralized and carries fair values in silver and lead. H. M. Bowen is manager.—Considerable machin-

ery is to be installed this winter at the placer mines near Temple Bar.—Work at the Idaho mine at Cerbat is progressing nicely. The roaster will soon be ready for running.

PIMA COUNTY.

The Miner Hill Co. has closed down its property near Tucson. Owing to the price of copper, the force at the Silver Bell mine has been reduced.

PINAL COUNTY.

A good vein of copper has been found on the 185-ft. level of No. 2 claim of the Sultana-Arizona Co. near Kelvin. The main shaft of the Sultana is now 65 ft. deep, a two-compartment shaft is being sunk on another one of the company's claims.

CALIFORNIA.

BUTTE COUNTY.

The labor conditions at Oroville remain practically the same as last week, except that the union now has 200 members. No demands have been made as yet for an increase in wages. The men claim that they are forced to ask for higher wages owing to the fact that while the cost of food and rents have increased steadily during the last few years, their wages have been the same for the last six years or more. The dredge companies all assert that they will not grant any raise if it is asked. The Leggett dredge has been paying the winchmen \$3.50 and the oilers \$3 per day for several months. As there are nine men to a dredge the increase of 50 cents to each will only amount to about \$1,600 a year.—Preparations are being made to resume work at the old Cherokee hydraulic mine on Sugar Loaf Mtn., where new pay gravel was discovered last winter. This summer several hundred feet of 14-in. pipe has been laid to bring water to the mine.—Several small veins of chrysophase, a semi-precious form of chalcedony, have been found near Oroville. These veins occur in granite.

CALAVERAS COUNTY.

Active work has begun on the North Star gravel mine. The mine is opened by an 1,800-ft. double-track drain adit. This cuts the channel at the lowest point in the company's property. The North Star company owns 3½ miles along the channel which is practically virgin ground. A large force of men is employed at the mine; L. Everett is superintendent.—Good ore has been found at the Gwin mine in the new drift on the 2,600-ft. level at a point about 400 ft. from the shaft; the vein is 50 ft. wide at that point.

ELDORADO COUNTY.

Good pay gravel has been found at the drift mine of the Prevolcanic Channel company, 18 miles east of Placerville. The channel already has been cross-cut for 20 feet.

INYO COUNTY.

A good strike of ore is reported in the tunnel of the True Fissure mine.

(Special Correspondence).—The past few weeks has seen a great deal of development work on the various lead-silver prospects and mines in this district.—J. P. Pitting, who is developing a property in the Saline valley has struck a large body of rich galena ore which runs also well in silver.—G. W. Oberholtzer, who is associated with E. W. Smith of Tonopah and L. S. Bishop of Big Pine, reports a promising strike of lead ore in some claims that he has located about one mile east of the Bunker Hill property. He will start further development work in the near future.—Eastern parties have taken a bond on the copper property belonging to J. S. Simmonson. This property adjoins Joe Wright's copper claims which are opened up by a tunnel 50 ft. long, the entire face showing an average of 6½% copper with some gold and silver values; the ore is oxidized. Mr. Wright expects to do further development work this fall and winter. These properties are situated at the head of Mazourka canyon and about 13 miles northeast of Independence in the west slope of the White Mountains.—The Montezuma Extension Mining & Milling Co., with G. M. McCollough as manager, is now working in silver ore which assays about 254 oz. in silver to the ton.—W. H. Ulmeyer is working his property four miles southeast of this place and reports that he has found some very good

ore. He has been driving a tunnel and is in about 50 ft. and will start to cross-cut from that point.

Big Pine, Oct. 27.

MONO COUNTY.

The demands for shorter hours at Bodie have been withdrawn by the union as a result of the report of the arbitration committee which found upon investigation that the profit at the Standard mine did not warrant a shortening of hours.

NAPA COUNTY.

The Aetna quicksilver mine has been bonded by a New York syndicate.

NEVADA COUNTY.

A discovery of gold-bearing galena ore has been reported near Bowman's dam, 35 miles northeast of Nevada City. —Nevada county is being flooded with miners from the copper camps of the West; many have been put to work but a good many are waiting for jobs. Globe, Arizona, has furnished the greatest number of these miners. —A good body of rich ore has been found in the recently reopened Golden Gate mine. —At the Yuba mine near Maybert, 28 miles northeast of Nevada City, the east vein has been found after a long search within 40 ft. of the drain tunnel in a cross-cut run from it by the present company. This cuts the vein at a depth of 1,200 ft; the orebody is 3 ft. wide. It is expected that the 20-stamp mill will be crushing steadily by Christmas.

The Greenhorn property is being tested by drills to see whether it will pay to dredge the gravel and old hydraulic tailings left on it. —Grading has begun for a 5-stamp mill which is to treat ore from the Austin mine at Willow creek. A new pump has been installed at the mine. On the 400-ft. level drifts are being run both north and south on the vein. The mine is looking well. —Another rich strike of ore has been made at the Kenosha on the 300-ft. level. When the shaft was flooded the last blast had just broken into a body of good ore on the 400-ft. level. The water-level is being rapidly lowered and every one is anxious to get a view of what the last blast on the 400-ft. level had disclosed. —Extensive improvements are to be made at the Grey Eagle, near Maybert. A hoisting plant will be installed at the end of the long tunnel and the pay-shoot followed below the adit-level. New concentrators will be added to the 10-stamp mill. —The new 5-stamp mill at the Marcotte mine is running satisfactorily.

PLACER COUNTY.

The Crater mine in the Ophir district has been pumped out to a depth of 800 ft. This old mine will now be thoroughly prospected. —The Malmberg 5-stamp mill in Auburn ravine is running on custom rock from the Boulder mine. —Considerable development work is being done at the Paragon mine where they think they have found the upper lead. —The new boiler at the Slope mine is in place and the pumping is progressing again. About 40 men are working at the Slope and the Buckeye mines. —The Dairy Farm mine has been shut down by the Guggenheims until they have made a definite decision in regard to the building of a smelter at South San Francisco. —H. M. Jarvis, representing an Alabama company, has bought the Hosmer claim adjoining the Grey Eagle on the east and south. He has also bought the Owl Creek ditch and will extend it down the North Fork slope and there generate electricity for working the Grey Eagle. The Grey Eagle tunnel will soon be reopened and retimbered.

SHASTA COUNTY.

(Special Correspondence). —The slump in the price of copper has not affected Shasta county mines to any great extent. Even the suspension of construction work at the Balaklala smelter took place some time ago and is due mainly to the negotiations pending. It is believed that the bondholders are trying to get control. In the meanwhile, work at the Balaklala and Shasta King mines has been discontinued, enough ore having been opened up. —The manager of the Mammoth Copper Co. states that the company will continue to operate the mine and continue work on repairs at the smelter. The Mammoth company employs about 1,200 men in the mines and at the

plant. The management further states that the ores of the Mammoth contain enough gold to make the smelting of 4% copper profitable. —The Mountain Copper smelter at Keswick is still operating, and development is continuing as formerly at the mines. —The Great Western Co., operating the Afterthought mine and Ingot smelter, is working on the old scale, and does not expect to curtail the operating expenses on account of the low price of copper. —Large reserves of ore are blocked out in the lower levels of the Gladstone, but extensive development is still being done. —At the Yankee John the shaft is down 100 ft. and a large quantity of ore running \$30 per ton is being developed. A rich strike was recently made near the bottom of the shaft. Anson B. McMay is superintendent. —Some excellent ore is being developed in the Rattler, and large quantities have been shipped to the Mammoth smelter for



Map of California.

fluxing purposes. —Developments at the Mountain Monarch are steadily progressing, and some good ore has been blocked out. —At the Delta Consolidated considerable development is under way in the upper levels, and some promising ore has been exposed. —The main shaft of the Gold Leaf has attained a depth of 170 ft. and ore is being shipped from the 7-ft. vein to the Keswick smelter. Extensive driving is being done. H. O. Cummings is the superintendent. —An immense quantity of ore is blocked out in the Hornet mine, while systematic development is opening up a large area of virgin territory. —The Guggenheims have commenced the shipment of 1,000 tons of copper ore from the Golinsky mine to Kennett. From that point it will be transported to one of the smelters controlled by the Guggenheim interests. The ore has been extracted while doing development work under the terms of the bond. —The 3-ft. vein of rich gold ore, recently struck at a depth of 185 ft. in the White Oaks mine, is improving with development. H. O. Cummings, superintendent of the Gold Leaf, is in charge of the White Oaks.

Redding, Oct. 26.

Work has been resumed at the Golden Leaf mine in Lower Spring district; this mine has been shut down for about a month. Work will soon begin on the electric road which is to extend from the mine to the Southern Pacific tracks near Middle Creek station.

Work at the Keswick smelter has not been effected by the slump in the price of copper, and still is running full force. The ore carries gold and silver, which helps out

greatly when copper is low in price.—A new transformer is being put in at Heroult, and the company hopes to be making ferro-silicon in another week.—As their bond on the Golinsky group, at Kennett, will expire in December, the Guggenheims are going to ship copper ore from that mine to some of their other smelters.

IDAHO.

SHOSHONE COUNTY.

(Special Correspondence).—The closing down of the Wallace Stock Exchange and the failure to pay a dividend by the Snowstorm Mining Co. were the two leading features of last week's developments in the Cœur d'Alene. The closing down of the Stock Exchange has been a matter for little regret in the district and the influence of the local market as well as the Spokane Exchange is considered to have been anything but beneficial to the mining industry of this region. Wash sales and selling short were the direct cause of the death of the institution and, while an attempt to prevent these was made both at Spokane and Wallace, the new conditions came too late to revive public confidence in the market.—The failure of the Snowstorm company to pay a dividend has also had a most depressing influence when, coupled with the reduction of \$60,000 in the monthly dividend of the Bunker Hill & Sullivan Co., it is considered that the Snowstorm company has always proved a key to the whole industry in this quarter. Inability of the smelters to handle the ore and the low price of copper are the reasons given for the passing of the dividend. The mine at the same time continues to employ much the same number of men as formerly and about 100 tons of second-class ore are being treated by the mill. The new bunkhouses erected by the company at a cost of \$50,000, with accommodation for a force of 250 men, were completed and occupied today.—Work has been resumed in the Copper Queen mine at Mullan and a splendid showing of chalcopryite ore has been made. So far the vein has not been fully cross-cut, but already it shows 10 in. of solid 30% chalcopryite and about 5 ft. of high-grade concentrating ore. The strike on this property is a most important one, as the mine adjoins the Reindeer on the east and covers the same lode.—A new company, known as the Shoshone Concentrating Co., has been formed for the purpose of working over the tailing of the Last Chance mine at Wardner. The tailing dump is estimated at 1,600,000 tons. The directors of the new company are M. C. Murphy, Julius Zittel, and William A. Bradley. A 300-ton mill will be erected at once and it is estimated that a profit of about \$1 per ton will be made on the entire mass.—The mill of the Success mine, one of the regular dividend-payers, has resumed after having been shut down for about three weeks to permit of the installation of new jigs, rolls, and vanners. With the new complement of machinery the capacity of the mill will be about 1,500 tons of dry concentrate per month and about two-thirds of this product is zinc concentrate. A new \$10,000 bunk and boarding-house to accommodate 100 men is nearing completion.—O. H. Linn, superintendent of the Success mine, has taken a contract from the Buffalo Co. to drive a 3,000-ft. cross-cut adit on that property. The consideration will be entirely in treasury stock. The necessary surveys for the adit, and also for a flume or pipe-line to develop water-power, is being made at present. A compressor will be installed at once and buildings to accommodate 10 men constructed. The adit will develop two veins that traverse the company's property, giving a depth of 500 ft. on the first, which is a copper vein, and about 2,000 ft. on the second, which is a galena vein. The veins are about 1,500 ft. apart.—The owners of the Pilot mine, at Murray, from which the highest grade gold ore ever found in the Cœur d'Alene has been taken, are now running a lower adit to tap the ore-shoot in depth. This adit has now been driven about 50 ft., but it will have to be driven fully a distance of 150 ft. more before the vein is reached. From this point it will be extended as a drift 500 ft. to get under the ore-shoot in the upper adit.—The capital of the Gertie Co. is to be increased from \$100,000 to \$150,000 in shares of the par value of 10 cents. The increase is due to the fact that the company's stock is non-assessable and there is only a

small amount of the treasury stock now on hand. A force of five men will be kept at work at the mine throughout the winter.—Steady shipments of ore are being made by the Monitor mine at Saltese, Mont., and the main shaft on the property is being sunk to the 500-ft. level and the work of driving on the 400-ft. level is making good headway. Some excellent ore has already been encountered on the 400, although the drift is not yet under the main ore-shoot.

Wallace, Oct. 19.

MICHIGAN.

KEWEENAW COUNTY.

Active exploratory work, consisting of diamond-drilling and trenching, is going on at the Seneca property. The drilling is being done to determine the line of strike and the dip of the lode in order to properly sink the shaft. A trench about 5 ft. deep some 600 ft. from the northeastern boundary of the property showed the outcrop of the lode. This has greatly diminished the amount of drilling that would have otherwise been necessary. It also shows that the Kearsarge lode extends into the Seneca property. The Kearsarge lode, which makes such a decided bend to the westward in the Gratiot property of the Calumet & Hecla Co., seems to again assume its former strike in the Seneca, and so this new shaft will probably line up with those of the Ojibway.—The bottom 50 ft. of the No. 1 shaft of the Medora mine belonging to the Keweenaw Copper Co. is in good ore.—The buildings on the No. 18 location on the Osceola amygdaloid are being erected rapidly. The ground is being broken for the No. 18 shaft, which is to be of three compartments. The ladder-way and pipe compartment will be placed in the centre. The heavy I-beam bearers are being put in place.—A new wooden shaft-house is being built at the No. 17 shaft of the Calumet & Hecla on the Osceola amygdaloid. This is similar in size and design to those at the No. 19, 20, and 21 shafts on the Kearsarge lode.—The overburden is being removed at the No. 1 shaft of the Ojibway. Concreting has begun at the No. 2 shaft, which is now about 100 ft. deep. At this shaft, which is being sunk in the foot-wall of the Kearsarge lode, the ore carries shot copper, and is of fair grade.

The shafts on the Montreal lode at Delaware have been shut down and all development work has been stopped. This was being done by the Calumet & Hecla. The unwatering of the old mine on the Allouez conglomerate at that point is still going on.—The Gratiot property, belonging to the Calumet & Hecla, north of Mohawk, is looking well. Driving is being done on the 200 and the 300-ft. levels. The Gratiot No. 1 shaft is now 475 ft. deep. Sinking is going on at No. 1 and No. 2 shafts.

NEVADA.

CHURCHILL COUNTY.

More ore has been shipped from Wonder this last week than in any previous week in its history. The Nevada Wonder shipped 16 tons; the Jack Pot, 23; the Vulture, 20 tons.—The ore from the Jack Pot comes mainly from the 200-ft. and 300-ft. levels.—At the Nevada Wonder the shaft is down 500 ft. and a level has been started at that depth.—The vein at the Ruby mine has been found again and a shipment of ore is expected to be made next week. The shaft was sunk on the vein, but at a depth of about 100 ft. the vein was cut off by a fault. A cross-cut was started and at a distance of 71 ft. cut the vein. Then the shaft was sunk farther and entered the vein at a farther depth of 54 feet.

ESMERALDA COUNTY.

Owing to fear of a run upon the local banks, Governor Sparks last week declared a legal holiday extending over a period of several days; this enabled the banks to have time to ship gold from the outside, so that there was no run upon them when they reopened. The Goldfield Stock Exchange was also closed the last of the week, but dealing in Nevada shares continued on the San Francisco Exchange. The local union has voted down the proposition to strike in sympathy with the Bishop, Cal., employees of the Nevada California Power Co.—The total output of the mines this week was 5,390 tons of an estimated value of \$508,920. The Mohawk Jumbo shipped 730 tons; Mohawk

Combination, 520; Mohawk, 2,375; Begole lease, 482; Combination Fraction, 62; Combination, 5; Hayes & Monnette dump, 53; Little Florence, 260; Florence L. & M. Co., 110; Florence Annex, 35; Rogers Goldfield Syndicate, 15; St. Ives mine, 26; Codd lease on St. Ives, 17; treated at Combination mill, 560; treated at Kinkead mill, 140 tons.—The Goldfield Consolidated is negotiating for a lease on the Best & Belcher mill at Virginia City, which has a capacity of 150 to 200 tons per day. The company is also negotiating for two other mills, and if these deals are consummated it will be in position to be independent of the smelters. The Kinkead and the Combination mills now treat about 800 tons per week.—The Mohawk Jumbo lease of the Jumbo Extension has been closed down since the 21st, owing to a dispute between the Jumbo Extension and the Mohawk companies over the boundary line between the two properties. A joint survey is being made to determine this.—Last week Thursday the Rogers syndicate found a good body of ore on the Red King claim of the Florence property. This ore was struck on the 409-ft. level at a point 175

developed. The orebodies have been exposed by a 150-ft. tunnel, and a 40-ft. incline shaft.—A good ledge of high-grade gold ore is being developed in the Le Maine-Phillips property.—The main shaft at the Golden Eva will be sunk to the 200-ft. point and levels opened at advantageous points. The main shaft is down 70 ft. with several small shafts and tunnels on the property. The ledge is four feet wide and assays from \$40 to \$60 per ton in gold. The mine was recently purchased from A. R. Harcomb by J. H. Dorst and C. H. Snow.—A small shoot of ore running 400 oz. silver per ton has been struck on the 200-ft. level in the Little Giant. The mine contains ore carrying lead, silver and gold and has been a producer for over 30 years.—Excellent ore is being developed in both shafts of the Black Jack. The mine is controlled by a syndicate of Salt Lake men.—Several important discoveries of lead, copper, gold and silver veins have been made during the present summer near Battle Mountain, and it is thought that section will in time rank among the important mining districts of Nevada. Salt Lake people have been particularly active in securing promising properties there.

Austin, Oct. 24.

LYON COUNTY.

The Nevada-Douglas company is working again with a full force of men. The winze from the north drift on the 550-ft. level of the Ludwig is still in high-grade copper ore. As yet the vein has not been reached in the cross-cut on the 650-ft. level, it being still in the limestone hanging wall. No stoping has been done in the orebody on the 550-ft. level. Water-pipe is being put in to bring water from the Nevada-Douglas tanks to the Ludwig shaft and an air-pipe is also being put in to run the hoist and air-drills at the Ludwig.—At the Mason Valley mine water has been met with in the winze from the upper adit at a depth of 50 ft.; the sinking has stopped until a pump can be installed. The lower adit has not cut the vein as yet.

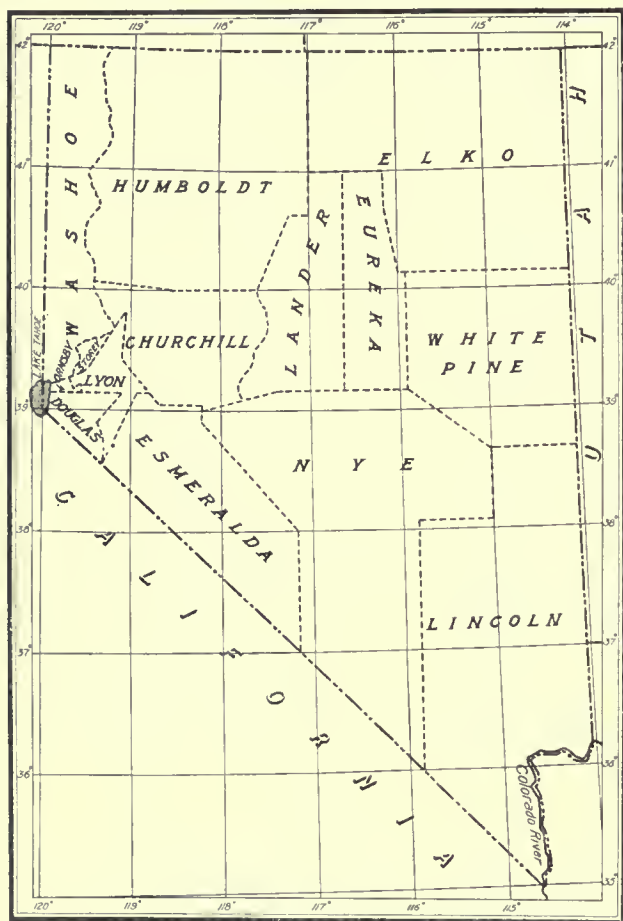
NYE COUNTY.

(Special Correspondence.)—Ground will be broken this week for the Homestake-King 20-stamp mill, in which amalgamation, concentration, and cyanidation will be used.—A trial run is being made this week at the Gold Bullfrog mill. This mill was completed some time ago but owing to an insufficiency of water, the commencement of operations has been deferred until the present. A well drilled on the property to a depth of 800 ft. has produced water enough to run the mill about half the time.—The Phillips & Moesser lease on the Gibraltar continues to sack several tons of ore daily which is said to average a little over \$200. The outcome of this lease will doubtlessly encourage others in this district to make ventures along this line.—Work on the 500-ft. level of the Mayflower has been suspended for the present until the pump can be installed, but the vein on that level had been cross-cut for a distance of 22 ft. with an average value of \$18 per ton.

Rhyolite, Oct. 23.

The ore shipments from Tonopah mines for the week ending Oct. 15 was 6,732 tons. The Tonopah Mining Co. shipped 4,466 tons; the Belmont Development Co., 1,676; West End, 45; John Gregovich, 21; Tonopah Extension, 263; Jim Butler, 100; Montana-Tonopah, 60 tons.—The mills at Miller's siding, which were shut-down several days last week, in order to relieve the fire-boxes and overhaul the boilers, are running again.—Development work continues at the Tonopah-California, but although some small bodies of ore have been found, no large orebodies have been as yet developed. In the future most of the work will be confined to the 600 and the 675-ft. levels.—The Supreme Court of the United States has decided in favor of the North Star company the case of Porter et al. v. Tonopah North Star T. & D. Co. The plaintiffs claimed the property on Mizpah hill under an alleged mining location known as the 'Dave Lewis Hope.'

At the Wolfstone the miners began stoping last week so as to have ore broken when the Lemmon mill starts.—The Manhattan Consolidated has 600 tons of ore sacked ready to send to the Manhattan Ore Reduction company's stamp-mill when it starts.



The Counties of Nevada.

ft. northwest of the shaft.—Rich ore has been struck at the Sandstorm mine in the Parkison & Erbel lease; it is supposed to be an extension of the orebody worked by Loftus & Davis in Block 5 three years ago. The lease has still almost a year to run, as work began on Oct. 15, the ore being struck almost immediately.

LANDER COUNTY.

(Special Correspondence).—The district surrounding Austin is attracting considerable attention from mining men, and several important deals have been consummated during the past few months. Many of the old mines are receiving renewed attention and several promising prospects have been bonded for development. It seems as if this famous old camp is destined to enjoy a measure of its old-time prosperity when it was one of the most active camps in the West.—The Copper Canyon mine, near Battle Mountain, is steadily shipping large quantities of high-grade copper ore. Much native copper has been extracted.—The Nevada Copper Butte M. Co. is developing five promising claims near Valmy.—The Pedro group has been bonded by a strong company and will be energetically de-

Special Correspondence.

London.

Camp Bird Annual Report.—Interesting Data.—Quarterly Report.—Oroville Dredging. — Somera. — Mexico Mines. — Esperanza Profits.—Results at the Dolores.—Gloomy Mining Market.

A complete presentment of the position and prospects of the Camp Bird Co. is to be found in the annual report supplemented by the Chairman's address at the recent stockholders' meeting. The more than usually intelligent questions put by some of the stockholders present at the meeting elicited particulars of interest not included in the annual reports. The Chairman made a good point of the fact that in spite of the large sums required for the reconstruction of the mill the total expenditure on the properties and their equipment still corresponded very nearly to the issued share capital of the Company (£820,000). The value of the ore treated was much higher than the average of the mine in the past, namely £7 4s. 2d. against £5 17s. 4d. the previous year. This was owing to the policy of catching up the financial position during the second half of the year which had fallen back during the first half, or reconstruction period, when the work in the mine was suspended. For the same reason the standing and other charges per ton were higher, but less money had naturally been spent in blocking out ore, with the result that the cost per ton worked out at 17s. 9d. against 20s. 6d. for the previous year. The Company's earnings from 38,295 tons dry ore crushed amounted to £179,681. After deducting the payment to Mr. Walsh of £38,591, cost of shares in Imogene Basin Gold Mines Co. £29,310 (out of a total of £30,310), and London Office expenses, and providing for depreciations and income tax, there was a net balance for the year of £98,116. Dividends aggregating 2s. 6d. per share (12½%) absorbed this amount together with £4,384 from the previous year's profits, and the credit balance carried forward as on May 1, 1907, was £111,237. Mr. Walsh had received in all, as his 25% of net proceeds, £170,000, leaving a further amount of £230,000 receivable out of future profits to complete the contract with him. The Company owns 574,230 shares of \$1 each in the Imogene Basin Gold Mines Co. out of a total capital of \$3,000,000. No further work was done on this property owing to lack of labor. The new Camp Bird mill of 60 stamps was designed with special reference in the main to the practice of the old mill, but with an increase in the weight of the stamps from 850 to 1,050 lb. The ore reserves were drawn upon during the year to the extent of the net earnings with the exception of £15,000, which amount resulted from the year's development, so that the value in sight declined from £881,000 to £717,000. The exploratory work, which aggregated 2,997 ft., is described in the Consulting Engineer's report as having shown "fairly satisfactory" results. This is scarcely borne out by the particulars in the General Manager's report, most of the points referred to being either in low-grade or unprofitable ore. At the same time much contemplated and important work remained in abeyance owing to shortage of workmen after the six months stoppage and the General Manager mentions additional developments which should be carried out in "promising territory." The Chairman endeavored to raise the stockholders' hopes by reminding them that they had three years' ore in reserve and a very large working capital with which to prosecute development work. Mr. A. C. Beatty reported that the development work in depth had only shown small irregular bodies of

ore, but that it has not advanced sufficiently to allow him to express an opinion as regards the ultimate outcome of the work in depth. Mr. Beatty was confident that large ore reserves would be opened up in the western part of the mine, and he seemed to have no doubt that the result of development work in that direction would give satisfactory results.

Since the annual meeting, the Camp Bird quarterly report to July 31 has been issued, showing increased activity in all departments. The net earnings at the mine amounted to £373,714. The developments totaled 1,459 ft. with improvements in value and appearance of the vein at several points. Dividend No. 22 of 1s. per share (£41,000) was paid in August. A melancholy interest attaches to this report. It is the last that will be issued over the signature of C. R. O'Flaherty, the late Secretary, that courteous and capable official having passed away after a short illness.

Oroville Dredging paid its eighth quarterly dividend of 12½ cents per \$5 share (700,000 shares) on September 30. During that month the weekly returns fell off, owing to interruption of the power supply by a severe storm. The total gold yielded from August 1, 1905, to September 9, 1907 is given as \$1,682,580.

The report of the Somera Gold Mining Co. (Mexico) for the period from the incorporation of the company (December 14, 1905) to June 30, 1907, states that of the authorized capital of £500,000, 234,000 shares of £1 each, fully paid up, have been allotted to the El Oro Mining & Railway Co., in payment for the property, and 216,000 working capital shares have been subscribed for and allotted, upon which the sum of 5s. per share has been called up.

The directors propose to make a further call of 5s. per share before the end of the year. During the period under review a sum of £30,951 has been expended on the installation of surface equipment and machinery and upon development work underground. Mr. R. M. Raymond reports that the drift northward upon the Victoria vein has now advanced for a length of 80 ft. into the orebody and for that distance it shows a width of 2 ft. 4 in. and an average value of \$59.34 gold and 20.9 oz. silver per ton.

The profit and loss account of Mexico Mines of El Oro for the year ended June 30 shows that, after providing for all general expenditure in Mexico and London and a small sum for depreciation, a net realized profit of £41,107 has been earned. The new mill was not in operation during the period under review, and this profit arose from the sale of 2,739 tons of high-grade ore, which realized £61,453. The sale of ore has enabled the directors to provide the funds necessary for the erection of the new mill and for the development of the mine and to meet all general expenditure. Mr. Raymond estimates the amount of ore at present available for extraction at 178,000 tons, and places its average value at \$11.53 gold and 6.9 oz. silver per ton, but does not include in this estimate the high-grade shipping ore exposed in the stopes above the No. 3 and No. 4 levels. At the annual meeting held this week the chairman, Mr. R. T. Bayliss, pointed out with satisfaction that the sales of high-grade ore had provided all the money required for the erection of the new mill and for surface equipment and for the development of the mine and all general expenditure. He regretted that it has taken longer to construct the new reduction works than was at first anticipated, partly, but not entirely due to the fact that, owing to the congestion of traffic on the railways of the United States, great delay occurred in delivery of machinery. The mill as now completed is highly efficient and it is expected to treat 200 tons per day when in full working order with 90% extraction. The estimated profit is \$7 per ton on

ore of a gross value of \$15, which will yield an income of close on £100,000 per annum. The chairman described the results of the developments at many of the points in the mine and said that in view of the lengths already opened on the two orebodies on the No. 3 and No. 4 levels, he felt very hopeful that there would be a considerable income from high-grade ore, and without in any way desiring to suggest that they had another Esperanza West vein there as yet, he thought that from time to time and from different portions of the mine, they would pick up a considerable amount of similar sort of stuff.

The profits of Esperanza (Mexico) for May, June, July, and August, make up a total in America of \$670,000 in round figures. The last quarterly dividends declared of 5s. 6d. per share (£125,125) is payable on October 19. Another Mexican mine, the Dolores, is doing well, as will be seen from the following particulars:

	Net tons ore treated.			Average value.	Monthly profit.
	From mine.	From dump.	Pan tallyng.		
July.....	986½	95¼	.....	\$89.14 19.12	\$46,000
August.....	1,146½	.....	207½	39.84 81.87 44.71	\$38,000

During July there were break-downs in the mill, and in August the returns suffered from lack of fuel and labor. In these respects the outlook for September is said to have improved. The mine continues to open up well in the deepest workings. The San Francisco cross-cut has encountered a heavy flow of water, which would seem to presage proximity to the vein.

The promise of improvement in the mining markets, noted at the beginning of September, has not materialized. Mines have suffered in sympathy with investment stocks from the unsettled state of the great international markets, coupled with the slumps in copper and tin.

Mexico City.

Effects of Low Metal Prices.—Several Mines and Smelters Shut Down.—The Belt Railroad at Guanajuato.—Prospecting the Veta Madre.

As was to be expected, and as has been rather anticipated in a former letter to the PRESS, the present low price of all the metals has been felt and is having its effect throughout the Republic of Mexico. From the daily press it is perhaps generally known that there has been a material curtailment of the production of copper in Cananea and throughout the State of Sonora. And even before this action by the large producers at Cananea, the small properties in almost every district where copper is the principal product had closed, only such larger properties continuing in operation as wished to maintain their organizations or by reason of a high-grade ore or other (as gold and silver) contents could afford to continue production. And many that were simply in a stage of development have also closed. Among the more important properties in the central part of the Republic that have ceased production are those of the Coahuila Mining & Smelting Co., near Viesca, State of Coahuila; the mines of the Aguascalientes Metal Co., in Tepezala, Aguascalientes, controlled by the Doerr Bros., one of whom is manager of the Aguascalientes smelter, and which mines were shipping some 100 tons daily of ore running about 3 to 4% copper and 6 oz. silver per ton; but the Guggenheim properties at Tepe-

zala are still working in order to supply as much ore as possible for the A. S. & R. Co.'s smelter at Aguascalientes. At Jimenez, however, the Jibosa mine of the American Smelters Security Co. has closed down, as have those of the same company at Velardeña, State of Durango. These Velardeña properties are of two classes, copper and lead, but in both groups the ore, though in large bodies, is low-grade; and it is said that neither could be made to pay at the present prices of those metals. Whether this will lead to the closing down of the A. S. & R. Co.'s new plant at Velardeña cannot be learned, though considerable custom ore is still being received there as usual. But it is not alone the copper properties that have been forced to curtail, for the continued fall in the prices of silver, lead, and zinc has necessitated the closing down of some of the producers of these metals also, or the cutting off of the low-grade ores and limiting the production to the high-grade material. What effect the financial difficulties, that have shown up in New York this week, may have on the mining industry in Mexico cannot as yet be surmised. Certain it is that it will cut off the promotion of any new large enterprises. It is pleasing to note, though, that as yet it has not seemed to affect the much-needed belt railroad for Guanajuato, as a contract has been given to E. J. White for the



Mexico.

first section, which will take in the San Prospero, the Bustos mill of the Guanajuato Reduction & Mines Co., the Sirena of the Guanajuato Consolidated, and the Aparecida, in short, Guanajuato proper, and as several hundred men are at work it is expected that this section may be completed by April. The estimated cost for the entire line is \$35,000 per km., or \$2,000,000 for the 60 km. The three kilometres between the Pinguico mine and mill is already completed and in operation with mule-power pending the arrival of the Shay engines to be used on the belt line. It is also gratifying to be able to state that the grading of the Mexican Central branch from Marfil into Guanajuato has been completed, the rails are being laid and there are hopes that trains may be running into Guanajuato before the end of the year. It is to be hoped also that an end has been put to the robberies in this district, which, among other things, resulted in the murder of George W. Rose of the Nayal company and carrying off of \$15,000 worth of bullion from the Guanajuato Consolidated (since recovered, however, and it is believed that the leaders of the gang are in custody). While speaking of Guanajuato, I should mention something of the plans of the Mineral Development Co. It is the intention of this company to sink a shaft to a depth of 2,500 ft. and then cross-cut to and prospect the Mother Lode at that depth. The shaft has

already attained a depth of 850 ft., and to encourage the project the Mexican Government has granted a concession of P100 for each foot driven below the 1,500-ft. mark. This is valuable evidence of federal support and is said to be due to the diplomacy of Theodore Dwight, who succeeded in demonstrating to President Diaz that this scheme to explore the Veta Madre was of first-rate importance.

In regard to the Guerra al Tirano mill, in Chihuahua, recently mentioned in these pages, it may be added that the original mill was ordered at San Francisco in December, 1905. Owing to the congested condition of the trails and the scarcity of mules, hardly any of the machinery reached the mine until October, 1906, and the last of it not until February, 1907. The machinery consisted of three 50-hp. boilers, 75-hp. twin engines, 2 crushers, 3 sets of rolls, 2 elevators, and 3 trommel screens, redwood leaching vats, piping, roofing iron, etc. On account of the delay the plans of the mill were changed from a stereotyped flat-site mill to one more adapted to the locality, that is, a gravity mill throughout, with shaking screens, ample elevation being allowed between the last rolls and the leaching vats, to permit of considerable additional re-grinding machinery and other improvements for successful operation, such as sizing cones, spitzkasten, slime-agitator, filter-press, etc. The lumber for this modified mill was cut at a considerable distance from the millsite and with the greatest difficulty was dragged over tortuous steep mountain trails. The building was completed simultaneously with the arrival of the last of the machinery, nearly sixteen months from the start. O. B. Finn resigned at the end of February, 1907, and his successor (Frank Holmes) arrived in March. The first ore put through the mill demonstrated that additional disintegrators would have to be added at once. The new manager decided on stamps and immediately ordered 10; these were placed in the building awaiting them. This of itself, for that country, was a good job. The ore is a silver sulphide with a little gold. The mine was developed to the 500-ft. level and a rich core in the midst of the main orebody has proved continuous to that depth. It was estimated that there was enough of this high-grade in sight to offset the cost of the mill, but it is not at all likely that it has been mined and realized upon by this time.

Butte, Montana.

The Barnes-King Fiasco.—Butte Coalition.—West Colusa Fire Underground.—Curtailment of Output.—Raven Mines.—Snowstorm Passes Dividend.—Smellers Close Down.

Another interesting development in the Barnes-King fiasco is the denial of Walter Harvey Weed that he had anything to do with the reports made on the property for the promoters. Mr. Weed says he never had any connection with the Barnes-King Co.; he explains that once he made an examination of the Barnes-King mine in behalf of a client who was considering the purchase of the property, but who concluded not to go any further in the matter. This examination, says Mr. Weed, was geological, and he says he neither measured the ore reserves nor made any valuation. The fact remains that the promoters of the Barnes-King deal used a report purporting to have been made by Mr. Weed, although only portions of such report were quoted in the advance papers, and a part of the alleged report was made up of assays of ore alleged to have been taken from the mines. No one knowing Mr. Weed will doubt his denial, but the question arises: Where did the promoters get the report and assays purporting to carry Mr. Weed's endorsement, and alleged to

be his own work? Was it an absolute fabrication, or were portions of the report he made to other clients used by the promoters of the Barnes-King? The new board of directors of the Barnes-King Co. has not yet been able to get together the papers and books of the company, and little progress has been made toward preparing a statement for the stockholders to show what became of the \$2,000,000 subscribed by them for the purchase of the \$50,000 property. Two experts have been at work on the mine for a week. Some of the deluded subscribers have served formal legal notice on the directors to bring action against the promoters and former directors for an accounting and to recover the money alleged to have been obtained by fraud.

The Butte Coalition Co., since the curtailment of copper production, has confined its operations to the Barnes mine, from which it is shipping an average of 500 tons of ore per day. The ore is of good grade, equal to the average from the mine of the North Butte Co. The Coalition has stopped all construction work, including the extensive operations on the surface of the Tramway, where a big hoist is being built jointly by that company and the Butte & Boston. The only work now going on there



Montana.

is the erection of the big steel head-frame, which is being done under contract. All the other work has so far advanced that it can be resumed at any time and finished before it is needed. At the Minnie Healey mine nothing is being done by the Coalition, but the Boston & Montana is opening the Minnie Healey shaft and putting it in condition for use as a vent for the smoke from the West Colusa mine. The Minnie Healey is entirely free from gas and smoke, and it has been demonstrated that there has been no fire in the workings of that property, and that the fire is in the West Colusa, an adjoining and connecting property owned by the Boston & Montana. The fire has not abated in the slightest, but it will be but a question of time when it will be thoroughly confined and controlled, as the Boston & Montana is sinking and opening four shafts to the fire zone, including a new shaft on the Leonard (being sunk right over the fire), two old shafts on the Gambetta, and the Minnie Healey shaft. The company will also sink the shaft of the Alex. Scott mine, owned by the Butte-Montana Co., 500 ft. deeper, having secured permission to use it as an air and working shaft until the fire is under control. The Butte-Montana Co. will derive great benefit through the arrangement, as it will save the cost of sinking the shaft, which it would have been under the necessity of doing itself.

There is rumor of a possibility that the Butte Coalition Co. will pass its next quarterly dividend. There are

also persistent rumors that the company may suspend operations entirely until the metal market improves. It cost the Coalition an excess of 10c. per pound to produce its copper last year, and at present prices, even if its product could be sold, there would be scarcely any profit. A. C. Carson, the manager, is now at New York in consultation with the Eastern officials.—It is not yet certain that there will not be a further curtailment on the part of the other companies, but the Butte officials of the Amalgamated and North Butte companies hope there will be no necessity for such a step. The North Butte probably reduced its working force more than any of the other companies. The North Butte is mining some very rich ore again, however. The ore that comes from the 1,800-ft. level of the Edith May averages about 11% copper. Very little dead work is being done by the company at present.—The Anaconda, Boston & Montana, Butte & Boston, Parrot, and Washoe companies continue at about the same rate of production as they did in the early part of October, about 26% of the normal.

E. C. Frisbie of Hartford, Conn., president of the Raven Mining Co., and W. Spencer Hutchinson, the company's consulting engineer, were here during the past week to inspect the work being done. Mr. Frisbie says the property has never been in better physical condition than it is now, and that the future is promising. The incline shaft on the Raven claim is now down 947 ft. and is timbered nearly to the bottom. The station at the 900 has been completed and sinking has been resumed. The shaft will be taken to the 1,100-ft. level, from which point a cross-cut will be driven to the vein and driving done to determine the extent of the orebodies. The stringency at the money centres and the demoralized state of the copper market have had no effect on the operations of the Raven Co., the work of development having progressed steadily since the reorganization.

The Snowstorm Mining Co., which passed its October dividend, will also pass the November dividend. The company has been distributing \$45,000 monthly since the first of the year, but accumulated no surplus, the earnings having been expended in improvements and dividends as fast as accumulated. The company had been treating 150 tons of low-grade ore at its leaching plant near the mine and shipped 300 tons daily of first-class to the smelters. Last week an accident to the mill necessitated a closing of the plant, and about the same time the smelters notified the company that only a limited amount of ore could be received because of the unsettled condition of the metal market. Shipments were therefore cut about in half. The manager says a resumption of work at the mill will depend on the price of copper, as at present prices the mill cannot be operated at a profit, it having been treating ore that averaged 2½% copper. The working force at the mine has also been reduced. T. L. Greenough, the president, says there is enough ore blocked out in the mine to last for three years, and that the ore will average 5%. Some time ago Snowstorm stock was selling above \$4 per share. It is now selling around 90c. Mining men who have examined the property have been enthusiastic in their reports about the ore reserves, but the ore is of a peculiar character that is purchased by the smelters only in limited quantities.

The East Helena smelter, a branch of the American Smelting & Refining Co., which has been taking a lot of ore from small operators in Butte and elsewhere throughout the Northwest, has given notice that for some time no more ore will be accepted, except from mines having contracts with the smelter. Similar notices have also been given by the Utah smelters and the Clark Reduction works in Butte, because of the condition of the metal market.

Denver, Colorado.

Treatment Charges on Cripple Creek Ore.—The Golden Cycle Mill.—Another Mill at Colorado City.

The animated discussion that has gone on for a long time regarding treatment charges on Cripple Creek ore has been given a new impetus by the developments of the past week. To go back to the beginning, the lessee has in the past had the choice of either sending his ore to the Pueblo smelters or to the chlorination-cyanide mills of the United States Reduction & Refining Co. at Colorado City and Florence. The treatment charges of the smelters have been high, but they are justified by the smelters on the ground that the ores are not easy to flux and are generally too fine to be smelted directly. When the modified Huntington-Heberlein process was introduced into the Pueblo plants it was found that the fine ore from Cripple Creek was admirable as the stiffener in the pot charges, and can be used in place of lime. This did away with one difficulty, but the smelters did not reduce their charges until obliged to do so by a cut in rates levied by the mills.

The 'mill trust,' as the U. S. R. & R. Co. is generally known, maintained a sliding scale of charges based upon the gold content of the ores, varying from \$6.25 per ton for ore under \$10 in value up to \$14 for those over \$150 per ton, which it claimed to be only a reasonable amount in excess of the cost of treatment. To this the miner made the same reply as the Missourian, and, believing himself caught between the devil and the deep sea, loudly deplored his fate. Then the Golden Cycle Mining & Milling Co., itself operating mines and leases, came forth like a noble St. George to slay the dragon. The site and plant of the old Telluride company, now defunct, were bought and Philip Argall was engaged to design a plant to operate along the lines laid down by Skewes and Marriner in Western Australia, and a \$750,000 plant was constructed. Early in the spring of 1907 this began operations with a scale of treatment charges so far below those then in force that almost immediately the larger part of the custom ore was diverted to its 750-ton per day plant. Most of these producers entered into a contract, which at that time appeared a wise movement, though subsequent developments proved otherwise. The smelters reduced their charges on such ores as are desirable for them, underbidding the Golden Cycle enough to get all they wanted. The U. S. R. & R. Co. simply closed down its Florence plant, reduced the tonnage at its Colorado City plant, and sullenly announced that it was prepared to wait until the Golden Cycle got tired of its rates. What the success of the Golden Cycle was is a little difficult to learn, as its period of activity was so brief. Many conflicting statements are made, but the general truth seems to be that the mill was well designed, except as to its amalgamated plates and the use of mercury, both of which had speedily to be abandoned. The old Holthoff-Wethey furnaces retained from the Telluride plant were also entirely unsatisfactory, improper draft conditions made it impossible to heat the furnaces hot enough for satisfactory roasting, and finally led to the explosion of unburned gases that caused the fire which resulted in the destruction of the roasting, crushing, and sampling departments.

In its management the plant was even more unfortunate. It was the worst of judgment to dispense with Mr. Argall's services before the plant was finished; it was equally so to attempt to start up a large plant in which there are so many new features with only the assistance of men whose experience in even small plants of simple type was painfully limited. Such difficulties as were encountered are most largely to be attributed to the lat-

ter, although attempts were made to magnify the former. Archangels may be able to design plants so that nothing in them need to be changed; it is folly to expect a human being to do it.

Within an extremely brief period after the start, the Golden Cycle mill was destroyed by fire, only the transformer house and cyanide plant remaining intact. Since that time it has been treating the tailing dump of the Telluride plant. Although announcements are made that it will immediately be rebuilt, the rate at which the work of rebuilding scarcely justifies any very high hopes on the part of those who were bound by contract. Within the week the U. S. R. & R. Co. has published a new scale of treatment charges, about 15 to 20% lower than those formerly in force. The reduction is not in the nature of a 'bargain sale' but simply a recognition that the charges have been too high. This now makes it the more doubtful that the Golden Cycle plant will resume operations.

Within the week it has also been announced that James Burns is to build a 750-ton per day mill at Colorado City. It is also said, with a knowing look, that F. A. Heinze is back of Mr. Burns in the movement. But, judging from his operations in Wall Street, Mr. Heinze is so far behind as to be indistinguishable in the rear, while if Mr. Burns is no more successful in milling than he is in lawsuits, he is also not likely to become a serious factor in this question. What Colorado City needs is not more mills, but better mills. Indeed, it begins to seem as though the proper place for a mill is in the mining district and not at a distance.

Salt Lake, Utah.

Important Suit.—Shipments From Tintic.—Effects of Low Copper.—Mining News From Stockton.—Annual Meetings.—Diminished Smelter Receipts.—The Honerine Company

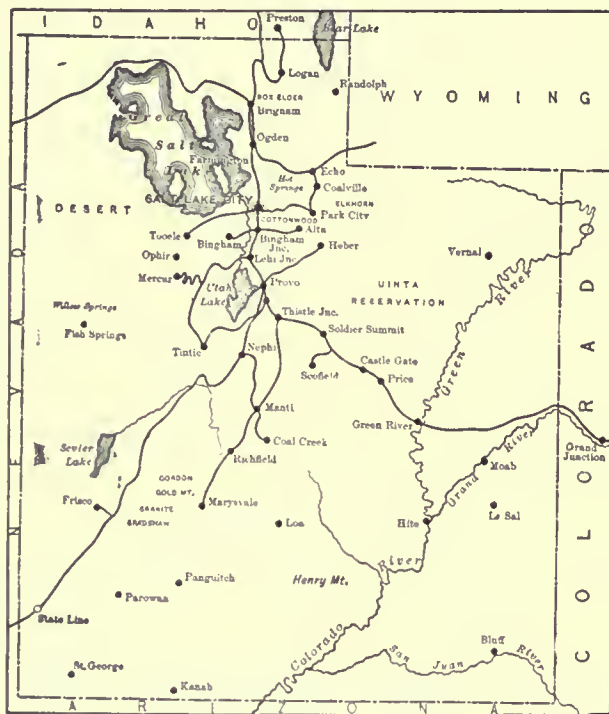
The ore and bullion settlements reported at the close of business hours last week amounted to \$743,000.

An important mining suit is to be filed in a few days; it will involve the ownership to a large block of stock in the Colorado mine, one of the principal producers and dividend-payers of Tintic. The plaintiff is Joseph L. Wilson, an old prospector, who was one of the original incorporators of the Colorado company. Wilson returned to the State a few weeks ago after an absence of more than five years and he is now seeking to recover property of which, he claims, he has been unjustly deprived and which is valued at more than \$315,000. Wilson formerly owned a third of the capital stock of the Colorado company, but through sickness and poverty he was driven to part with all but 30,000 shares. During his absence, so Wilson alleges, the company was re-organized; the capital was increased from 250,000 shares of the par value of \$1 each to 1,000,000 shares of the par value of \$1. Wilson claims that he was never consulted about this change in the company's capitalization, although he was a director of the old corporation, and also claims that not all of the stock to which he was entitled had been issued to him for the reason that the shares were pooled for a stipulated length of time. It was this pooling arrangement, he declares, which caused him to feel that his interests were safe during his absence. When Wilson went away, however, the Colorado was nothing more than a prospect; but now it is regarded as being one of the leading mines of the State.

Ore shipments from Tintic last week amounted to 148 carloads, the contributing mines and amounts being: Ajax, 2; Beck Tunnel, 5; Bullion Beck, 3; Curisa, 2; Colorado, 11; Centennial Eureka, 51; Eagle & Blue Bell, 8; Eureka Hill, 6; Grand Central, 7; Gemini, 5; Lower Mammoth, 7; May Day, 9; Mammoth, 3; Scranton, 7; Tintic Iron,

12; Uncle Sam Con., 6; Victor Con., 1; Yankee Con., 4 carloads.—The new equipment for the May Day mill has been installed and the capacity of the plant has been considerably increased.—Tracklaying is progressing satisfactorily on the Eureka Hill railroad, which is to connect the principal mines of the Tintic district with the new smelter being erected by the Tintic Smelting Co. The road will be 10 miles long when completed. The building of the smelter is going ahead steadily and will be completed about the first of January.

It is claimed that fully 2,000 less men are working in the mines of Bingham than was the case 60 days ago, and there is every reason to believe that this statement is correct. With the exception of the Utah Consolidated, Utah Copper, and one or two others, all of the mines of the camp have either curtailed their operations or have shut-down entirely. The Ohio Copper Co., while it is



Utah.

pushing work on its 2,000-ton concentrating mill with all the vigor possible, has ceased doing any development work in the mine. The latter, however, is in condition to supply the mill with ore for a long time to come. In all probability the plant will be started on ore delivered over the tracks of the Rio Grande Western. The completion of the Mascott tunnel is not absolutely essential to the starting of the new mill; yet the expense will be somewhat greater—probably 10 cents per ton.—The United States Supreme Court has rendered a decision in the case of Leonidas M. Lawson v. United States Mining Co., which gives the defendant title to ores contained in the Ashton and Kempton lodes in Bingham, valued at about \$3,000,000. Col. E. A. Wall, of Salt Lake, is the heaviest loser by reason of the verdict. The case has been in litigation for six or seven years and both sides have been to great expense in fighting it.

The annual meeting of the Honerine Mining Co., with properties in the Stockton mining district, resulted in the re-election of the retiring board of directors and the election of G. A. Baird of Chicago as president and Charles Dupont of Salt Lake, secretary. An assessment of 45 cents per share has been levied to pay off the existing indebtedness of the corporation, which amounts to over \$200,000. There is a plan on foot to bring about a merger with adjoining properties, which can be operated through

the Honerine adit. It is expected that the new equipment installed in the mill of the New Stockton Mining Co. will be in commission by November 1. The enlarged plant will treat 150 tons of ore per day.

The annual meeting of shareholders of the Ajax Mining Co., held during the week, resulted in the election of Thomas Weir, president; H. G. McMillen, vice-president, and J. M. Burt, secretary. During the fiscal year ending October 1, about 1,000 ft. of development work was performed and 8,091 tons of ore marketed. The year began with an indebtedness of about \$40,000 and closed with a surplus of \$20,000. The properties of the company are in the Tintic district.—The board of directors of the Little Chief Mining Co., operating at Tintic, has ordered development work suspended. The company has an indebtedness of over \$14,000 and no means of raising funds except by assessments, which are limited by law to \$2,000 monthly. The Little Chief mine is developed to a little over 1,000 ft., but as yet no persistent orebodies have been encountered.—The South Columbus Mining Co. has four faces moving toward ore and in two of them it has been encountered within the past week, demonstrating that the deposits found in the upper tunnel persist in depth. This mine was splendidly equipped during the past year and has one of the best plants in the camp of Alta.

The smelting companies operating in Utah have all called upon producers to curtail their output and, in the main, the request has been complied with. Smelter managers complain of a congested state of affairs at their plants, and that more ore has been received than they can conveniently take care of. Besides, the difficulty experienced in realizing promptly from the sale of their product has called for the adoption of protective measures.

Toronto, Canada.

Illegal Operations.—A New Smelter.—Ore Shipments From Cobalt.—News From the Mines.—Rich Strikes.

When the case against Law & Co., mining brokers, of Toronto, charged with selling mining stock in the Highland Mary Mining Co., of Larder Lake, without furnishing the information regarding the company and its property required by law, came up in the Police Court yesterday, the defendants did not appear. It was stated by J. W. I. Corley, Crown prosecutor, that efforts to serve Law personally with a summons had been unavailing, as he was said to be at Larder Lake. He is believed to be keeping out of the way to avoid service. The case was accordingly enlarged until October 30.

Thomas W. Gibson, Deputy Minister of Mines, and Willet G. Miller, Provincial Geologist, have returned from an inspection of the Deloro smelter, near Marmora, Ontario, which is being refitted for the purpose of handling Cobalt ore. It is expected to be ready for operation in about a month and will treat from 15 to 20 tons of ore per day. Speaking of the smelters and concentrating plants now either finished or in course of completion, Mr. Miller says: "When these various plants are in operation the Cobalt camp will be in a much better position than it has hitherto been, as its weak point has been in connection with the refining of its ores. When the mines were discovered no suitable plant for handling these complex ores existed in North America."

Shipments from Cobalt for the week ending October 19 were 369 tons from the following mines: Drummond, 32 tons; Kerr Lake (Jacobs), 30; La Rose, 140; McKinley-Darragh, 133; and O'Brien, 34. Of this three carloads from the McKinley-Darragh and two from the La Rose were shipped to the Denver smelters. The total shipments from January 1 of the present year to October 19

were 10,043 tons.—George F. Morton, of Morton & Co., who returned this week from Cobalt, states that the Nipissing was making preparations to carry on underground work during the winter months. Surface work will be discontinued and all work will be done in drifts and cross-cuts. The Kendall vein is showing well at a depth of 90 ft. The big silver vein on the Hudson Bay property has been traced on the north lot of the Nipissing and the large cobalt vein uncovered on the Hudson Bay some weeks ago trends in the same direction.—The Foster company has signed a contract with the Cobalt Concentrators Ltd. for the erection of a concentrator on their property.—The report of the Tretheway directors,



Map Showing Position of Cobalt and New Districts in Ontario.

covering the period from June 13, 1906 to August 31, 1907, shows total revenue \$249,262; operating and other expenses, \$124,739, leaving a surplus of \$124,522, out of which \$75,636 has been paid in dividends.—On October 19, in the course of sinking on the big vein on the Temiskaming & Hudson Bay, discovered last March, a strike was made at 100 ft., at which depth the silver-bearing portion of the vein shows a width of 10 in. and is of great richness.—A rich strike has been made on the Sargesson property in the Portage Bay district, where a vein several feet wide has been found on the surface and traced a considerable distance, some assays showing 2,000 oz. silver per ton.—Another strike at the McKinley-Darragh is reported, the vein being 18 in. wide of cobalt-silver with an average yield of 4,000 oz. silver per ton. Another 20-stamp unit is being installed, making 40 stamps in all.—At the Cobalt Lake mine a depth of 26 ft. has been reached in the north shaft.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

Capitalization of Rand Mines.

The Editor:

Sir—In the editorial columns of your issue of the 12th inst. I was much surprised to find an attack upon the integrity of the mining engineers of the Witwatersrand. As you are aware, practically 99% of the properties in that field are controlled by half a dozen financial houses, who employ a corresponding number of consulting engineers, consequently your charges are made against a very few men.

I think you must know of the custom prevailing in all English enterprises of keeping each man confined to his own special sphere of work. This is especially true on the Rand, and I speak from experience when I say that the engineers there were not consulted as to the amount of capitalization to be placed upon a property, the reason being that the financiers considered this was a matter belonging peculiarly to themselves. By far the greater portion of the deep-level ground of the Rand was purchased by the several controlling firms without asking for an opinion from the engineer; much of it was done, in fact, before his advent, and the latter was simply requested to lay out the ground and develop it after the company had been formed.

Your statement that many of the mining engineers "lured by opportunity of participating in big promotions, others carried away by an honest enthusiasm, did, indeed, give their authority to the over-capitalization, and, indirectly, to the wild dealing in shares," etc., is, in my opinion, most unjust and unfair. I do not know of a single engineer who has done this, nor do I agree with your statement as to the over-capitalization. The Rand Mines have an issued capital of £450,000, and paid 180% interest, in the shape of dividends, in 1906, equal to 9% on twenty times that valuation. The Witwatersrand Deep has an issued capital of £500,000 and is paying 40% upon that amount, and accumulating a surplus as well. To instance a later flotation—one that has occurred since the war—the Robinson Central Deep has an issued capital of £440,000 and is paying regularly 75% on that capital. I could cite dozens of other similar producing mines, if necessary, but it hardly seems worth while to take up your space. They certainly are not over-capitalized.

I am informed that the development in some of the deep-level mines is disappointing, causing some of them to now appear over-capitalized, but at the time the companies were formed the majority of them were not so, and the fact that the financial houses underwrote the working capital of many of these mines at 35 to 50 shillings per share to the extent of hundreds of thousands of pounds (which liability can never be avoided, although the shares may be bought in the open market for one-third or one-fourth of this amount), shows the honesty of their intentions at the time of making the flotation, and their belief in the value of the property. Such mines certainly do not deserve to be put on a par with the wild-cat flotations that one sees so much of nowadays in new mining camps, companies as devoid of working capital as they are of the means of raising it.

The value of the Rand was at first underestimated, as is the case in all new mining districts of lasting merit, and it was inevitable that speculation should follow upon the realization of the amount of gold to be won there,

but to say that the engineers lent, even indirectly, their authority to "wild dealing in shares" is not, in my opinion, called for or merited.

THOS. H. LEGGETT.

San Francisco, October 19.

Professional Customs.

[The questions to which reference is made in these letters will be found in our issues of October 5 and 12.—Editor.]

The Editor:

Sir—In answering the "searching" questions of T. S., it seems to me that these inquiries show a commercial rather than a professional spirit from one who, as he says, is at the beginning of his career. To make money rather than to strive for professional reputation seems to be the desire of most modern young men who are entering the profession of mining engineering. It strikes me that the first thing of importance is the building up of character and reputation, and that success in a money way will come as a result of this later on.

I shall attempt to answer the questions briefly and *serialim*:

1. The fee should include all traveling and other expenses of the trip. Engineers of experience know well the cost of trips of this nature, and business men prefer to know the exact amount which the report is to cost them. Putting it in another way, I should charge a lump sum for doing the work, including traveling and other expenses.

2. An exchange of letters is generally sufficient to bind a bargain of this kind.

3. As to payment of fee, it is usual for an engineer to receive a retainer on account of his fee before leaving for the mine. This retainer can be anywhere from 10 to 50% of his fee, according to circumstances. Usually clients are willing to pay one-half of the amount of the fee as a retainer, and the balance upon the completion of the work.

4. No, an engineer in good standing is expected to furnish his own outfit, which should include such surveying instruments as he might need, drawing utensils, et cetera.

5. It is to avoid just such difficulties as are mentioned in this question that engineers should make a flat charge to include all of these contingencies.

6. It is better before starting on a trip to have an understanding with your client that no information is to be expected, unless otherwise provided for, until the completion of the report in writing. One of the most trying things to an engineer examining a property is to be required to give his opinion before he has had opportunity of going carefully over his report and checking his data, having his assays made, et cetera.

7. An engineer should not buy shares on information gained at the expense of his clients unless he first communicates with them. As to buying shares after his report is in, this is a question of conscience. It might be that his buying or selling of shares would work a distinct injury to his clients, as he may not be informed as to the object of his employment. It is better on the whole to leave the stock market entirely alone when engaged in confidential work of this nature.

8. I should consider that it was not legitimate to take advantage of your presence in a district to examine and report upon other properties for a fee unless with the permission of your employers.

9. There should be no objection to publishing in technical periodicals a description of the district visited, provided you obtain the permission of your clients to do

so. It is well to remember in this regard that all of the information which you obtain from a mining district while on a trip for which you are paid, belongs to the clients or client employing you. You have made a bargain to sell this information, and you should adhere strictly to your share of it.

10. It is not always expected that an engineer will say 'Yes' or 'No' as to a property, but it is better to give a definite and decided opinion in each case, if it is possible to do so. It must be remembered that a business man is acting upon your advice, and he must have a definite and decided opinion in each case. With regard to doing work upon the ground, the engineer is justified only in clearing out old drifts or putting his client to this expense after he has communicated with him.

BENJ. B. LAWRENCE.

New York, October 14.

The Editor:

Sir—Referring to the subject of professional ethics covered by the letter entitled 'Searching Questions' in your issue of October 5, I shall express my views *seriatim* in answer to them. But it must always be remembered that great latitude should be allowed in these matters, since the personal equation is a most important factor.

1. Upon jobs of short duration, it is better to take a fee rather than a salary. With responsible people I usually ask for one-half in advance, and the balance, with expense account, upon rendering the final report. Engagements lasting over a month had better be on a salary basis.

2. The contract should be clear, and in writing. It usually matters not whether it be made by formal document or in a letter. Telegrams are apt to be vague, and sometimes open to a variety of interpretation.

3. Certainly, and it is always the safest plan.

4. Yes.

5. (a) Yes.

(b) Yes.

(c) This question is open to the objection that if the engineer travels second class and charges the company for first, the company is not getting that for which it paid, since the moment the engineer accepts an engagement he is a representative of the company. Furthermore, it is always desirable for an engineer to travel as a gentleman, and not to appear cheap in any way. Presenting a good appearance is a much more important thing than many people imagine, and it is sometimes the secret of success. Moreover, it must be a satisfactory condition to the engineer himself and to those who employ him.

(d) In a long trip it is difficult to keep count of all small expenditures, the money gets away, and at the end of the week a 'sundry' item of \$5 or \$10 would be legitimate.

(e) Yes, certainly, in amounts of over \$50.

(f) A question for the engineer to decide. He must be assumed to be a conscientious man.

(g) A monthly statement of expenditures should be submitted if desired by the company. In any case, the engineer would do well to balance his accounts once a week, for his own satisfaction.

6. Yes. The company has a right to expect reports of progress, subject to amendment in the final report, but it should be made clear that such statements are not a final opinion.

7. An engineer had better keep out of the share market. It is dangerous to him in more ways than one.

8. Not without a specific understanding with the employer.

9. No. None whatever, except perhaps in exceptional cases.

10. The engineer should report facts exactly as he finds them. A company or investor can decide whether or not they are justified in making the investment. Of course, if the engineer is asked for a yes or no opinion, the matter assumes a different aspect. As I take it, he is usually sent into the field to ascertain technical facts, and to interpret them to his employer, leaving the decision of the investment upon the latter. In the second part of this question, the engineer should be left to his own judgment, which will be guided according to the amount of funds placed at his disposal for the purpose.

The profession of a mining engineer is eminently a respectable one, and an engineer must always be careful to maintain his dignity and self-respect. Honest and faithful service should be his motto, rather than mere money-getting. The temptations for speculation are ever present, but must be guarded against most scrupulously. If mining engineers will always strive to maintain high ideals, they will be in a position to exact large fees.

F. LYNWOOD GARRISON.

Philadelphia, October 10.

The Editor:

Sir—I take this opportunity to answer the questions appearing in your issue of October 5 as follows:

1. For a large work it is better to charge a salary of from \$300 to \$500 per month.

2. It is not necessary to have a written contract with your employers; a letter is sufficient. Get pay in advance so as not to influence the report.

3. A lump sum can be demanded in advance to cover all the expenses of the trip.

4. The company must not be charged with the equipment necessary for the work, as the engineer is supposed to have a camera, surveying and assaying instruments.

5. (a) Tips to servants are permissible, as proper accommodations cannot be had without tips. (b) The engineer is entitled to the best first-class passage on train and on shipboard, and to the best accommodations at hotels. (c) It is not right for an engineer to travel second-class and charge the company first-class, as it would weaken the value of the report, if known. (d) The expense account is to be kept in a general way. Frequent charges of 'incidentals' to cover small expenses is permissible. (e) It is best to take vouchers for large expenditures, say, over \$100.

6. It is not a good plan to send periodical reports on the progress of the investigation, giving results, such as assays, as they are obtained in the course of the work; it is better to wait until finished, and then go over the work. The company is not justified in demanding frequent periodical reports of this kind.

7. No engineer should buy shares before the report is turned in, as it tends to weaken his report. It is all right to do so afterward, but it is better to keep clear unless the company invites it.

8. It is not legitimate to take advantage of your presence in a district, to examine, and perhaps option, mining properties for yourself, as it weakens the report.

9. Do not publish in technical periodicals any description of the district visited, or of the mines included in your examination, until at least six months afterward.

10. It is expected of the engineer to say 'yes' or 'no' positively. The engineer is not justified in spending company money to clear out old drifts, unwater shafts, and open caved ground, without notifying them and receiving orders to do so.

The best method for a young engineer to adopt in order

to succeed is to buy 1,000 shares of stock in a going mine, and then make the mine pay.

ALEX. ROY.

Oakland, October 8.

The Editor:

Sir—Referring to T. S.'s list of ten questions, as published in your issue of the 5th inst., I offer the following replies, understanding that the questions are asked in reference to a long journey of uncertain length to be made by a young mining engineer to examine a moderately priced property situated in the tropics:

1. A young engineer could not ordinarily charge a fee for such a trip, and it would be better for him to undertake the work on a *per diem* or salary basis.

2. Correspondence engaging the engineer is sufficient if he is dealing with responsible parties, but all details as to his proposed charges and expenses should be clearly understood.

3. A young engineer could not be expected to finance such a trip, and could properly ask for his estimated expenses in advance.

4. A charge should be made for only such equipment as is either consumed in the work or returned to the employer.

5. (a) No charge should be made for expenditures required to satisfy special personal habits.

(b) The engineer would be entitled to such traveling and living accommodations as would be used by the average business man.

(c) Nothing should be pocketed; the employer should have the benefit of any difference between actual and estimated expenditures.

(d) Minute detail in an expense account is not necessary.

(e) Take vouchers whenever possible as a matter of business, but they need not be turned in when making final settlement unless called for by the employer.

(f) The young engineer had better secure all his information by working for it. By so conducting himself as to command confidence he can gather plenty of gossip without paying for it.

(g) Render bill at the end of the engagement.

6. Ordinarily all an employer wants is one concise and definite report, but an engineer on a salary basis should report as frequently as his employer asks him to.

7. The young engineer should keep in mind that he has the opportunity of making business connections each time he makes an examination. He should make the most of such opportunities and not be tempted to take some unfair advantage because of inside information. All information secured at the expense of a client always belongs to the client, and the engineer should not use it for private gain unless the client consents thereto.

8. When making a trip on a salary basis with all expenses paid, the engineer's time belongs to his employer; but proper recognition would undoubtedly be given an engineer who might call his employer's attention to any profitable business other than the special business in hand. However, the engineer must not assume that his employer is able to handle any other business than the business in hand, and should not give outside business any of his time unless he has first obtained the consent of his employer.

On the other hand, if the engineer is doing the work for a fee, he could properly look at and option properties for his own account, provided: First, that he has completed his mission to examine one special property and his employers are looking for no other property; second, that he rebates to his employers a proper proportion of

his traveling expenses and offers them the opportunity to participate in his options.

9. Nothing should be published without first obtaining the consent of his employer.

10. While the engineer may not be able to say 'yes' or 'no' as to the property in question, he should be able to say whether it is 'good,' 'bad,' or 'doubtful.' If good, the engineer is justified in securing all the facts and data possible; if bad, he should go to no more time or expense than absolutely necessary; and if doubtful, he should not go to any unusual expense.

F. W. B.

San Francisco, October 21.

The Editor:

Sir—From my point of view it is rather surprising that several of the questions as to professional customs should be prompted by a desire for information. The tenor of your editorial and its reference to the motto "*Noblesse oblige*" necessarily implies a line of answers in harmony with most of those given in your issue of the 19th inst. Unfortunately, there are some whose training, or rather want of training, leads them to think that money-making is the sole criterion of success, and I am afraid that it must be admitted that the adage, "Honesty is the best policy," is not true to those who have this standard; their answers to these questions, or at all events, their practice, would be the reverse of those given. When a man is in doubt as to which of two opposite courses of conduct he should follow, he may be sure that the one which needs excuses to defend it is the wrong one. "*Qui s'excuse s'accuse*," and when "business is business" is given for the reason of an action, it may generally be considered as a defense of something that his conscience condemns.

Others of the questions are matters of common sense, requiring different action in every different case. As to charging expenses I was disgusted in my early life by an associate who gave petty details of every item, but was not at all scrupulous in weightier matters, so I adopted the opposite extreme, and for about fifty years have constantly rendered lump sum bills without a single item specified, the amount being obtained by balancing cash on hand at the beginning and the end of the trip, excluding any obviously personal expenditure, and I am pleased to say that never once has my account been even commented upon.

R. B. SYMINGTON.

San Francisco, October 24.

Slag-Dams.

The Editor:

Sir—In your issue of August 17 there appeared a letter by Mr. F. M. Smith, manager of the smelter at East Helena, Montana, describing a slag-dam which I designed and built in 1898, when superintendent of that plant of the A. S. & R. Company.

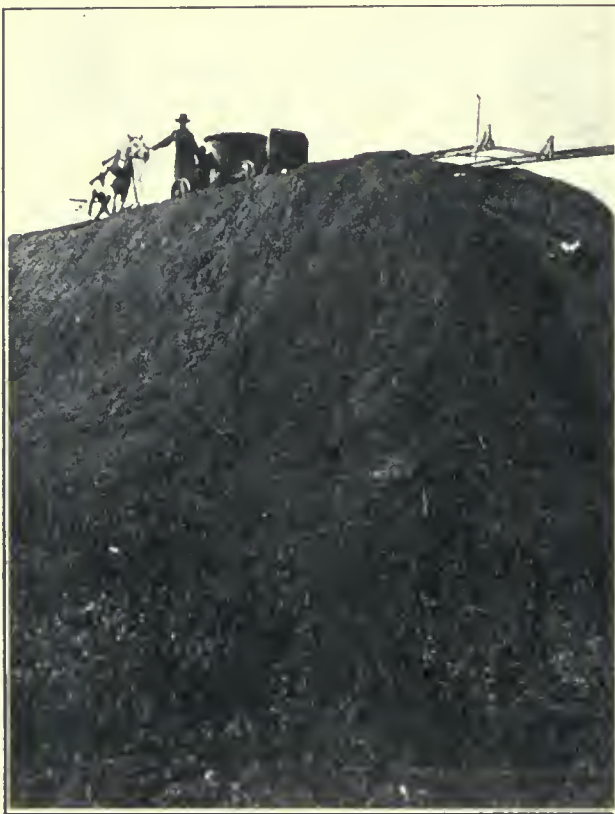
As it is the only large dam of its kind of which I have any knowledge, a description of the method of construction will probably be of interest to the readers of the Press. Up to the time of its construction the water for the jackets and for general use about the works was obtained from a ditch taken out of Prickly Pear creek above the plant. As the stream was subject to sudden rises and carried down a large amount of gravel and sand, mud, and general rubbish, the ditch was frequently filled up and the small dam was often washed away. The jackets and boilers were frequently either filled with mud or short of water, and the general discomfort and

interruptions to operations made it desirable that a large storage reservoir for settling be provided.

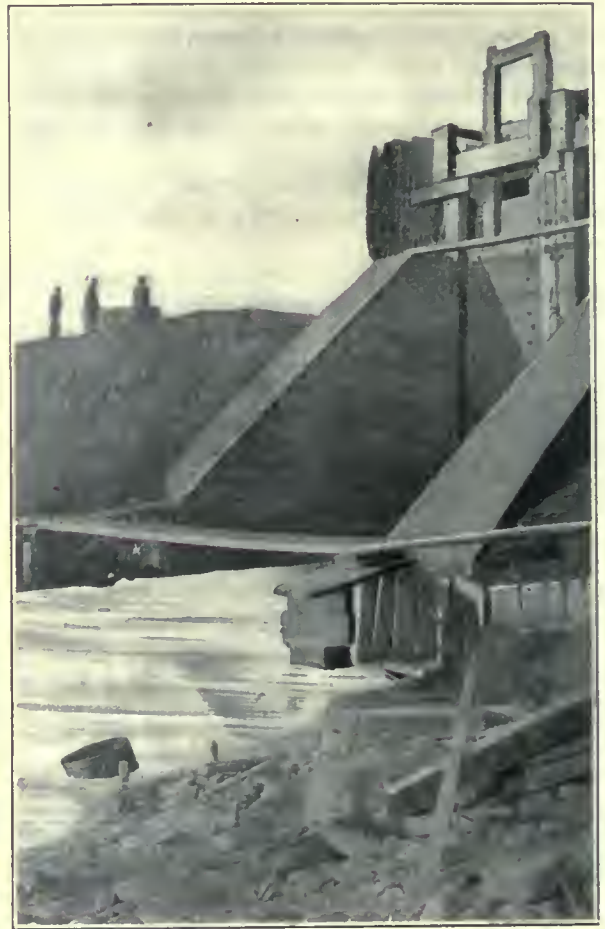
The creek-bottom at that point is about 1,500 ft. wide and about 15 ft. lower than the general level of the fan-shaped delta of the creek, as it issues from the gorge a mile or more above the works. The delta is a glacial moraine and contains a small amount of placer gold. The slag-dump had been built out from the furnaces so that about one-third of the creek-bottom had been filled up level with the tops of the banks. I proposed to extend a slag embankment like a railway fill across the remaining two-thirds and put in a spill-way so that the flood-water could pass and use the reservoir formed above the fill for storage. This plan was carried out and the dam completed about the time I left the East Helena plant to enter the services of the Mond Nickel Co. Mr. Smith's description of the dam is the first mention I have seen of it since that time, and as it is one thing that I have built that will probably outlast the present generation, a

ahead of him, as shown in the photograph. The photograph is not quite large enough to show the sheave on the end of the rail, but the rope and the rail show as well as the stop-guards on the rail ends. The driver rode on the car to operate the foot-brake and led the horse by the bridle. When the fill reached the ends of the rails, a short length was put in farther back and the whole frame (with the sheaves attached) moved forward. This process was continued until the fill reached the creek-channel and then a concrete dam on top of sheet-piling was constructed with gates and spill-way to take off the flood-water.

In order to make the bottom of the dam tight, a trench was dug four feet wide and three feet deep in the ground in the centre line of the dam before the slag-fill was



Pouring Slag Over End of Fill.



Slag Dam, Almost Completed to the Concrete Spill-way.

description of its construction may interest posterity as well as others. The slag from the furnaces was hauled out in twin pots on a revolving trunnion supported on a narrow-gauge railway truck. These pots were of the type built by the Colorado Iron Works and were drawn by a horse.

In order to extend the fill in a direct line, it was necessary that the slag should be poured over the end of the fill. To do this it was necessary to have the horse behind the pot when it came near the end of the fill. Standard-gauge rails of about 72 lb. per yard were fitted together with iron ties for the last 60 ft. of track and on the end of one of these rails an iron sheave was fastened. Two other sheaves were placed in a horizontal position so that a $\frac{3}{4}$ -in. wire rope could pass beneath the rails and around the sheave on the end of the rails extending over the end of the fill. By this means the wire rope was so arranged that when the horse was unhitched from the front of the slag-car and the end of the rope attached, the horse could be hitched to the other end of the rope and pull the car

made. There were some old ash-dumps near the smelter that had to be cut through and a slag-fill put in place on account of the porous nature of the ashes. When completed the dam made a lake about 2,000 by 1,500 ft. and 10 ft. deep at the lower end. It will probably be used for irrigation purposes long after the smelting industry has faded away for want of ores to smelt and in the dim and distant future I can imagine some archeologist contending with geologists that it is of human origin and not a lava flow.

HIRAM W. HIXON.

Victoria Mines, Ontario, September 15.

TUNGSTEN can be mined profitably in California. For example, one mine in Kern county yielded 28 to 32 tons per month for the 12 months of 1906. This was the 'best selected,' after hand-sorting and concentration. It carried 66 to 70% tungstic acid, which at, say, \$7 per unit, made the output worth about \$15,000 per month, or \$175,000 per annum. Almost as good as a gold mine.

Notes on Tube-Mills.

In the August *Journal* of the Chemical, Metallurgical, and Mining Society of South Africa, there are some interesting observations on tube-mill practice by J. Kennedy. He insisted that the work of the tube was due to grinding, rather than impact action, saying :

I had come to the conclusion some time back that manganese liners had not been given a fair trial before being condemned, as, at the Glen Deep, the life of manganese liners was about 90 days, while at the Robinson Deep the liners lasted only about 50 days; I therefore set to work to ascertain the cause of this marked difference in life, and in endeavoring to approach as nearly as possible the real thing, that is, manganese lining, I found that by loading a glass jar with small pebbles, which had been discharged from the tube-mills, the pebbles reaching just under the neck of the jar, when lying on four rollers, and clean sand and water at 1 to 1 being added to reach just under the centre of the jar, the jar then being made to revolve; the result was just as I had anticipated. Instead of the load being raised sufficiently high to enable the pebbles to roll and tumble over one another, the load, with the exception of a few pebbles, slipped on the side of the jar while revolving.

More pebbles were then added to bring the load well up over the centre, and the jar was started again. This time, much to my satisfaction, the pebbles, with pulp clinging to them, began rolling and tumbling over one another down the inclined surface of the load, formed by the rotary motion of the jar.

It is interesting to note how the pebbles and pulp rise at the ascending side of the jar, although to all appearances the water is level to about the outflow on the descending side.

Some members might still be of the opinion that this experiment does not prove that the grinding is not done by impact, and for their benefit I should like to explain that, in this experiment, when the jar was underloaded there was scarcely any sound noticeable while the jar was revolving, but when the pebble load was increased to the point mentioned, there was the noise of the pebbles striking the liner, which coincides with S. H. Pearce's experience while the manganese liners were being tried at the Glen Deep. Mr. Pearce stated that a good deal of difference was noticed in the sound of the tube-mill when this liner was first run, inasmuch as there was an absence of rumbling which had been a feature previously. He also stated that there was a tendency for the pebbles to wear flat, and the crushing efficiency dropped considerably. Later, the rumbling occurred again, and the crushing efficiency increased. He also concluded by remarking that he supposed that there was considerable slip on the smooth surface when starting, and that later the liner had acquired a rough surface and had raised the pebbles a little higher than the smooth surface had done, which fact causes crushing to be accomplished instead of reduction by attrition. The manganese liners when discarded at the Robinson Deep were as smooth as glass, and this proved that Mr.

Pearce's supposition was incorrect. The sole cause of the absence of rumbling and the dropping of efficient grinding was, that the mill was under-loaded. An important point which appears to have been overlooked when advocating the theory of crushing by impact is that, as soon as the rolling or falling pebbles touches the water, the pulp clinging to it becomes disengaged, and the bare pebble strikes the liner, and this accounts for the rumbling referred to.

With reference to hydraulic classification, I run seventeen classifiers, five abreast in the first row, and six in the two following, and use water on all, finding it essential to do so when dealing with a big tonnage with a limited tube-mill installation.

The longest life of silex liners, 4 in. thick, I have experienced is 108 days, and a lining of local chert, 4½ in. thick, has been running for 102 days, and to all appearances will last a fortnight longer; but it seems that the days of silex and chert as liners are numbered, judging by the success attending the lining accidentally invented at the Los Estrellas mine at El Oro, Mexico,* where the inventor had lined his mill with rifle-like castings in order



Slag Dam at East Helena.

Sheet piling before concrete dam for spill-way was put in. Smelter and slag fill nearing the spillway.

to raise the pebbles nearly to the top of the mill, thus increasing the height of drop. When the mill was opened after several hours' run, it was found that the pebbles had become wedged into the rifles, and thus formed a lining of themselves. After eight months' run the wear to the casting was found to be so slight as to indicate a life of two to three years.

EXPLOSIVES IN BRAZIL.—The use of powder for war and sporting purposes is rather limited, but the use of dynamite is rapidly increasing. The imports of both in 1905 and 1906 were as follows: Powder, \$56,383 and \$43,761; dynamite and other explosives, \$139,988 and \$178,754, respectively. The powder comes from the United Kingdom and Germany, while the dynamite and other explosives, in the order of their value, come from the United Kingdom, Germany, France, and Belgium. There are difficulties in carrying on the trade in Brazil. The duty, together with special dock and other charges, is about as follows, per pound: On dynamite, 18c.; on powder, 29c. gold. The regulations require storage under isolating conditions.

*See MINING AND SCIENTIFIC PRESS of October 12, 1907.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

CRUSTIFICATION is a banded structure produced by successive deposition of different layers on the walls of an opening; it is often visible in filled deposits.

FOR fortifying the cyanide solution, one method is to add cyanide in crystals to the head of the zinc-boxes, in quantity sufficient to keep the solution at normal strength.

MOUNTAINS, igneous rocks, folded strata, hot springs, and ore deposits are often all connected. The zones of folding in strata lie along certain lines of weakness in the crust.

EXPERIENCE at El Oro has shown that for reducing ore to 60 mesh by wet grinding, the Huntington mill is an effective machine. For finer grinding it is not well adapted.

MOVEMENTS in veins subsequent to the formation may produce a sheeting parallel to the walls, which may have somewhat the aspect of original crustification, and may be mistaken for it. This sort of banding is called ribbon structure.

IF a quantity of water be kept in a perfectly quiet condition, it is found that its temperature can be reduced to 20° or even 15° F before congelation takes place, but at the moment when this occurs the temperature rises to 32°. Hence, the freezing-point is not constant, but the melting-point of ice is always at the same temperature, pressure being neglected.

IN general a region of flat unfolded rocks is poor in ore deposits, as for example the region lying between the Rocky Mountains and the Appalachians, as compared with the folded region lying between the Rocky Mountains and the Pacific. When ore deposits do occur in such a flat region, they will often be found to be connected with some minor disturbance.

THE principal steps in the preparation of barytes for market are hand cobbing, sorting, crushing, washing or jigging, bleaching, grinding, and pulverizing. Such associated minerals as galena, quartz, calcite, and limonite, when occurring massive or as surface stains on the barytes, can be removed largely by hand cobbing during mining; but when galena or iron stains are scattered through the material, crushing and washing may serve to clean the barytes completely. The greater portion of the material that is mined is bleached.

PLATINUM was formerly found only in placers, but in Russia several years ago the metal was found as an original constituent in peridotitic rocks, and it is in a number of such rocks in America. Platinum in peridotite rock has been reported from the Tulameen region in British Columbia, and from dark basaltic rocks of fine grain in the same country. It, therefore, seems to be confined principally to the basic rocks, and is an intimate associate of chromite, although it has been found to a less extent in siliceous rocks, such as syenites.

THE characteristics by which the two kinds of asbestos may be best distinguished are the yellow-green color and oily or greasy lustre of the chrysotile and the unctuous feel of its soft, fluffy fibre, as contrasted with the white, gray, green, or brown color and harsher surface of the amphibole fibres. Attention has been called to the angular cross-section of the individual fibres in the case of the amphibole asbestos and the rounded or flattened outline

of the silky fibres of chrysotile. The chief chemical difference between the several varieties of asbestos, all of which are silicates, is the presence of water as a more important constituent in the chrysotile. By excessive heating the chrysotile may be made to lose this hydrous condition, and then the fibres become less silky and their strength is impaired.

EXPERIMENTS have been made in connection with radium in contact with the diamond, which showed that the beta rays from radium preparations had like properties to the streams of inactive electrons in a radiant matter tube. It was found, by exposing fine colorless crystals of diamond to radium bromide undisturbed for more than 12 months that the radium caused the diamonds to assume a beautiful bluish color. This color is persistent; it was affected neither by heating in strong nitric acid nor by potassium chlorate. Furthermore, the radium had communicated to the diamonds radio-active properties strong enough to affect a photographic plate; and when they were heated to a dull redness in a dark room a faint phosphorescence spread over the stone just before the color became visible.

AT Bendigo in Australia the deepest gold mining in the world is being done. At the Victoria Quartz shaft a level is being driven at 4,150 ft. At the first of this year the depth of the New Chum Railway shaft was 4,318 ft. and that of the Victoria Quartz shaft 4,254 ft. Besides these two mines there are 11 other mines at Bendigo between 3,000 and 4,000 ft. deep. The average yield of the ore mined at Bendigo is 8.9 dwt. per ton. The average cost of mining and milling per ton is about 6 dwt. All these mines are worked on a relatively small scale. The largest producer, the New Moon, only crushed 32,340 tons in 1906 (about 90 tons per day) while the average annual tonnage crushed at Bendigo mines is under 10,000. This low tonnage accounts for the high cost of mining. At the New Moon mine, where the average gold contents of the ore is 6 dwt. 5 gr., the costs, including office expenses, amounted to only \$3.42 per ton. At Ballarat the average yield of the ore mined is 5.3 dwt. per ton. Among the high-grade mines of Victoria are the Long Tunnel and the Long Tunnel Extended, both at Walhalla, where the ore in many stopes averages over an ounce gold per ton.

THERE is little doubt that many of the uses to which tin plate is applied could be quite well fulfilled by aluminum or galvanized iron, or, assuming the manufacture of such a material to be a practicable proposition, by aluminum plate—that is, iron coated with aluminum. The price of aluminum is now about that of tin and about 14 times that of tin plate, and as the specific gravity of aluminum is, roughly, one-third that of tin plate, the cost of aluminum sheet would be about four and one-half times that of tin plate of the same thickness. Therefore, before aluminum sheet can hope to compete with tin plate in the matter of price, one or both of two things must happen—a great increase in the price of tin, or a considerable lowering in the price of aluminum. The cost of tin and aluminum being about the same, there might easily be but little difference in the cost of producing the two kinds of plate, and that difference might be on either one side or the other, though it would seem probable that the cost of producing aluminum plate would necessarily be greater, owing to the higher melting point of aluminum and its ready oxidizability. As is well known, aluminum is sufficiently tenacious and malleable to replace tin plate, resists atmospheric influences well, and, whether as plate or sheet, could be employed in the manufacture of many domestic utensils and vessels.

Jigging by Hand.

Written for the MINING AND SCIENTIFIC PRESS
By ARTHUR C. NAHL.

Hand-jigs can often be effectively and advantageously used in treating dumps of low-grade material, without crushing, and with but a very small amount of water, when the material is too fine to be economically sorted by hand. Such material was found to be available in some of the dumps on the property of the Progreso Mining Co. at Triunfo, in Baja California, Mexico, and was worked at a good profit for three years with hand-jigs.

After six months of experiment, and after several single hand-jigs of different designs had been constructed, and their action studied, the design of jig which appears in Fig. 1 was gradually evolved. It was adopted as being the most serviceable and the most economically constructed. It required little or no repair except change of screens. As the drawing is to scale, little description is here necessary.

Since the drawing was made, a change has been adopted in the matter of counterbalancing. The diagram shows shoes of a large Blake crusher, bolted to the ends of the lever-frame, to balance the weight of the jig-box; but it being almost impossible to have the weights exactly equal, the lever-frame was subject to torsional strain. This, with continued jigging, soon twisted it, and threw the jig-box out of its horizontal position. A much simpler device was arranged by nailing a box of inch boards, 1 ft. wide and 11 in. high, to the back ends of the lever-frame. This had to be hung about two feet below the top of the frame, so as to clear the bottom of the chute, and braced with two straps of iron, which were fastened to the ends of the lever-frame, bent down around the counterweight-box and up again to the frame close to the bearing, and screwed to the box and frame. The two end boards of the box were long enough to be nailed to the ends of the frame. The straps of iron prevented the swinging motion from loosening the nails. The jig-box could be exactly balanced by filling the counterweight-box with rocks or scrap iron. This is the only change that has been made in the jigs, and it proved most effective in strengthening the lever-frame and preventing it from twisting and throwing the jig-box from its horizontal position.

It was found advisable to have a false bottom, with slanting sides, inside of the jig-tank, for the purpose of facilitating the discharge of hutch, at intervals, through a two-inch nipple at the bottom. We tried first to discharge the hutch at the front of the jig-tank, by means of an elbow and short piece of pipe, but, of course, this was impossible on account of choking at the elbow. So, in place of the elbow, a flange was screwed to the two-inch nipple, about two inches from the bottom of the tank. A groove three inches wide and one-quarter inch deep was cut across the face of the flange. Into the groove was fitted a movable piece of sheet iron 12 in. long by 3 in. wide, and a scant $\frac{1}{2}$ in. thick, having a 2-in. hole bored toward one end and held in place by a similar flange and a couple of bolts. This made an effective and simple hutch-discharge gate, and could be opened and closed from the front of the jig-tank. The movable piece did not have to fit very tight, for the hutch which accumulated on it kept it from leaking. To discharge the hutch, the gate is opened gradually, and it is scraped down with a shovel, and runs to launder in front of the jig-box, whence it is thrown into a wheelbarrow or one of the cars.

Though the drawing shows only two jigs together, we constructed them in units of five. We used 2 by 12 in.

plank, 24 ft. long, thus effecting an economy of space and lumber. At first we used old wagon springs for spring-boards, as can be seen in the photograph; but these were an endless source of trouble, and gave way to the simple form of board shown in the drawing. The spring-board is a most important part of the jig, and the cheapest, most satisfactory and durable kind for a five-compartment hand-jig is the one shown in the design.

The bearings used came from old cars; they were babbitted to fit a shaft of 2-in. pipe. The weight of lever-frame, jig-box, and counterweight-box holds the shaft in place in the bearings without caps.

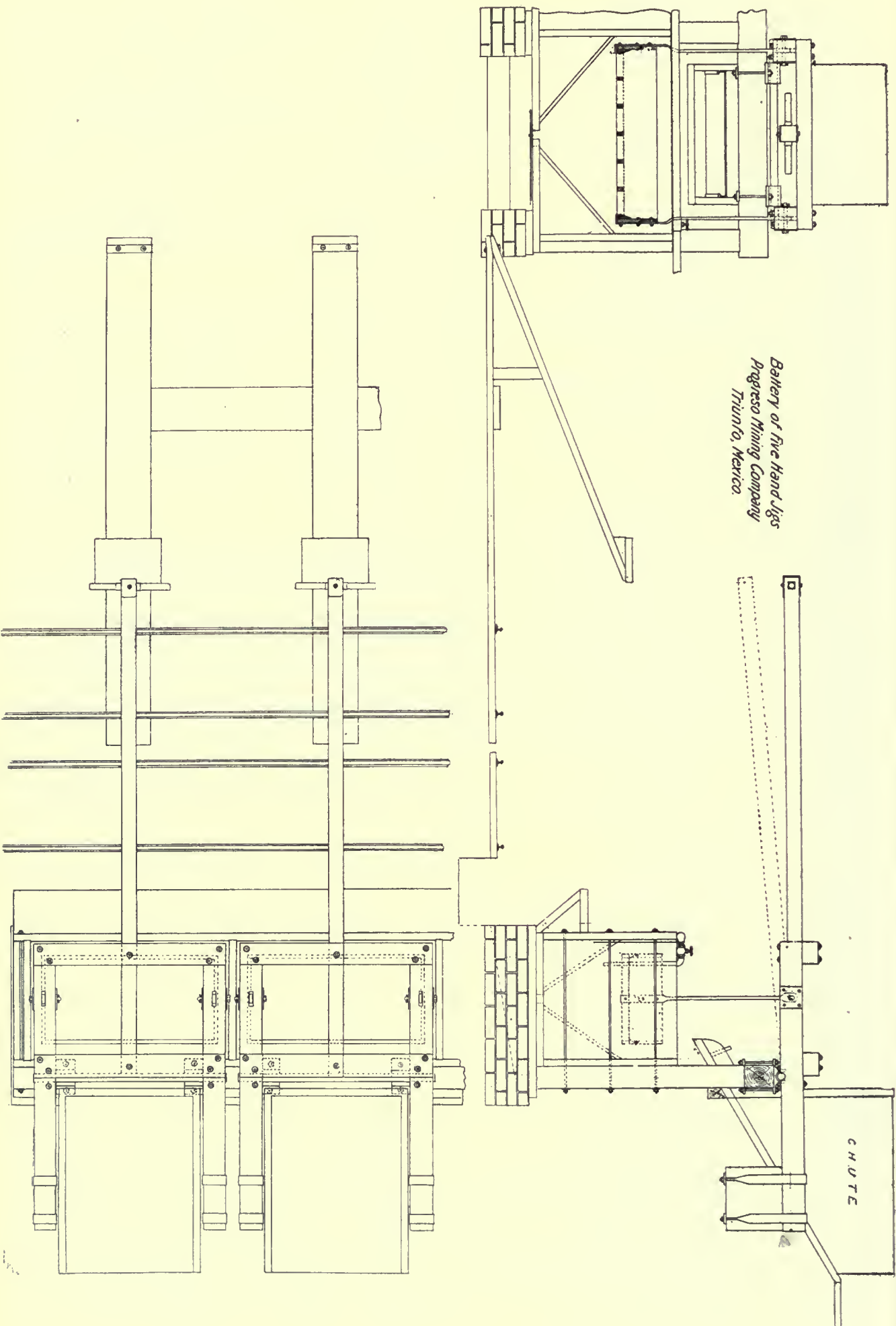
Each jig was fed from a chute. The material was carried through the chutes in wheelbarrows. In the single jigs no chutes were used, but it would have been almost impossible to fill the boxes in the five-compartment jigs without the chutes.

It will be noted that the jig-box, when it is raised out of the water, swings under the chute, but the top of the box does not quite touch the bottom of the chute, and the weight of the counterbalance when the box is empty is held by the cross-piece on the lever-frame which rests against the top of the chute. This is an important piece of construction, for if the jig-box were allowed to hold the weight of the counterbalance, by hooking to the bottom of the chute, it would soon be strained and twisted on the hangers out of its horizontal position. It is necessary always to keep the jig-box perfectly horizontal.

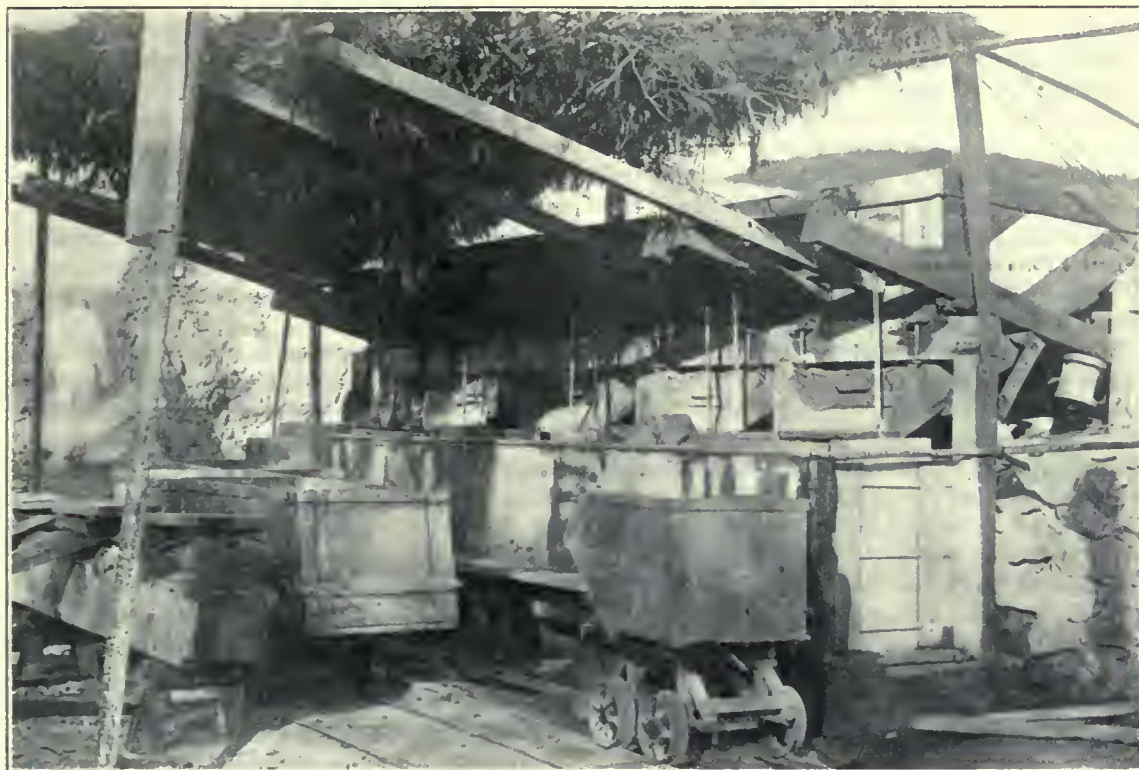
The treatment of the dump was as follows: The material was sized by hand on a steel wire screen, the size of the opening being about 25 millimetres, or 1 in. What passed through was re-screened by shoveling into a 10-mesh No. 18 wire screen, at a slant of about 45°. This was done to eliminate the fine dirt which greatly interfered in cleaning the ore and made thick muddy water, which had to be changed often. As water was scarce, it was preferable to rid the material of the fine in this manner. In the rainy season, when the dump was wet and screening was impossible, everything that passed through the coarse screen was sent to the fine jigs. Both coarse and fine jigs made more hutch in the rainy season, and the results were not so good. The oversize from the inch screen was sent to the coarse jigs, and that which passed the 1-in. screen and remained on the 10-mesh went to the fine jigs. What stayed on the inch screen and would not pass a 3-in. ring was picked out by boys. It was usually waste. The coarse jigs then treated everything between three inches and one inch, and the fine jigs, between one inch and the 10 mesh. Of course it was impossible to do perfect screening in this way, so the coarse jigs received some material that could pass an inch screen, and the fine jigs received a great deal of material that could pass a 10-mesh screen.

The coarse jigs required two men on the spring-board to give sufficient motion for separation. The length of stroke was from two to three inches, and about 90 per minute. A 10-mm. screen was used. After about 200 strokes, the waste was removed from the top with a shovel and scraper and thrown into the waste-car, and the concentrate, if sufficient to warrant, was thrown into the concentrate car. If the bed of concentrate was too thin, the jig-box was re-filled without discharging. No attempt was made at jigging on a bed in the coarse jigs. Heads to these ran about 8 oz. silver; concentrate, 23 oz.; tailing, about 3½ oz. Very little hutch was made. Two men on a jig could treat from 6 to 7 tons per day in 10 hours, and concentrated five tons of material into one of concentrate. Each man was paid \$1.25 per day. The cost per ton of concentrate was \$2.75.

The fine jigs were operated by one man on a spring-



Battery of five hand lugs
Pagsco Mining Company
Triunfo, Mexico.



Front View of Jigs, With Cars.



Men Operating Hand-Jigs.

board at 112 strokes per minute; length of stroke, 1 in.; size of screen, 8 mesh No. 16 steel wire. The boxes were not cleaned out entirely, but two inches of concentrate was usually left as a bed, and when this was removed, some second product was used for a bed. Hutch was jigged through this bed, and considerable was made. The average material handled ranged in size from 15 mm. down to fine grit. Value of heads, 9 to 10 oz.; waste, 2.5 to 3 oz.; concentrate, 30 oz.; hutch, 16 oz. About 4 tons of this material was concentrated into 1 of concentrate and hutch, in the proportion of about 1,500 lb. concentrate and 500 lb. hutch. Each fine jig could handle about 4 tons of material per day. Wages, P1.25 per day.

Two sets of five jigs were in operation, and usually six jigs were working on coarse, and four on fine, material. Ten men and boys did the screening and filled the chutes, at an average pay of one peso. Wages have recently been raised considerably.

While operating, the jig-box was kept wholly under water. In this manner, very little splash was made and the values in hutch were higher. The dump material consisted of ores from the stopes that were thrown over the dump with the waste from the mine. The ores consisted of iron pyrite, and almost all the silver minerals in a quartz gangue. The waste was quartz schist, quartz, and some cyanite.

The advantages of hand-jigging can be summed up as follows:

1. Need of a very small amount of water.
2. Low cost of installation.
3. Facility for moving from one place to another.

The advantage of the jigs here described is the economy and simplicity of construction, use of chutes, design of spring-boards, and convenience of the cars on tracks in front of the jig-tanks.

Uranium.

The current idea that uranium ores derive their value from their content of radium is probably due to the fabulous value ascribed to radium in many publications—a value based, perhaps, upon prices paid for it as a chemical and physical curiosity, since they are not justified by any uses thus far found for it. The principal known deposits of uranium ores in this country are in Colorado, where carnotite and uraninite (or pitch-blende) furnish the product. A reduction plant near Cedar, in San Miguel county, is operating on carnotite ores running 2% or less of uranium and having also a vanadium content. Deposits of carnotite near Meeker, in Rio Blanco county, discovered in 1906, were described by Hoyt S. Gale, of the U. S. Geological Survey, in Bulletin No. 315. The uraninite, or pitch-blende is mined in the Kirk, Wood, and German mines, in Gilpin county, Colo. Small quantities of uranium have been found in the Black Hills as uranium phosphate (autunite). Other small deposits, of mineralogic interest only, have been found in Connecticut, North Carolina, Texas, and California. So far but few uses have been found for uranium ores. Experiments made with the metal as a steel-hardening material do not show that any particularly valuable qualities are added to the steel that are not given by the use of other elements that are at present cheaper. Uranium in the form of an acetate is used as an indicator in various determinations in organic chemistry, and other salts are used in iridescent glass and pottery glazes.

MOUNTAINS of erosion are not necessarily upfolds. Upfolds tend to weaken the rocks so that they are more easily washed away.

Compressed Air in Cyanidation.

In the August issue of the *Journal* of the Chemical, Metallurgical, and Mining Society of South Africa, there is an interesting note by Andrew F. Crosse on experiments with compressed air as a means of assisting the solution of gold in cyanide solutions. He stated:

For many years I have been impressed with the idea of using compressed air, produced by a 'trompe,' for assisting in the solution of gold in the cyanide process. I believe that a trompe was first used in the Pyrenees, during the Middle Ages, for iron smelting. In this district (Pilgrim's Rest) we have abundance of water-power, and I erected a small trompe on my arrival here last October.

More than half the gold here is contained in the slime, so that a high extraction from the latter is absolutely necessary. You are probably acquainted with the Pohlé pump, which is the exact opposite of the trompe, the latter being an arrangement by which compressed air is formed, by being sucked down by water and delivered under pressure, while the Pohlé pump is an arrangement by which water, or any other liquid, can be lifted, under given conditions, owing to the reduction of its specific gravity, by the admixture of air. I make use of a conical vat, with a vertical pipe in the centre of the same, through which the pulp in the vat is lifted by compressed air, supplied by the trompe, two feet above the surface of the liquid; it falls over into an outer tube and is discharged through four pipes, having their orifices tangentially arranged so as to force the pulp into a circular motion. By this means I obtain full aeration and very rapid circulation. The solution of the gold is extremely rapid, and there is no machinery of any kind, it being absolutely automatic.

As this method was very successful, I applied the same treatment, slightly modified, to the treatment of sand. The sand must be perfectly clean and free from slime, such as is obtained from the Wilfley concentrator. I have arranged a vat from which the solution drains off into an air-lift pump; this solution is circulated through the sand. After a few hours the sand is full of air bubbles, and a rapid circulation of the liquid is maintained. These air bubbles are formed owing to the cyanide solution being surcharged with air, and they are deposited on the sand, in the same way that a piece of bread, thrown into a glass of champagne, is coated with carbonic acid bubbles. I have obtained 92% extraction of the gold by this means from 6.2 dwt. tailing in 24 hours, including washing. This result is, I believe, a record.

We live in an age when the development of the material resources of civilization is progressing in a ratio without parallel. International commerce spreads apace. Every year sees a greater demand for the raw materials and products, out of which the manufacturer will, in turn, produce the articles demanded by our complex modern life. We live and work in larger buildings; we make more use of mechanical appliances; we travel more, and our traveling is more expeditious than formerly; and not we alone, but all the progressive nations. The world uses more steel, more copper, more aluminum, more paper; therefore requires more coal, more petroleum, more timber, more ores, more machinery for the getting and working of them, more trains and steamships for their transport. It requires machines that will work faster or more cheaply than the old ones to meet the increasing demands of manufacture; new fabrics, new dyes, even new foods, new and more powerful means of illumination, new methods of speaking to the ends of the earth.

To Young Men About to Become Mining Engineers.

Contributed to the MINING AND SCIENTIFIC PRESS
By COURIENAY DE KALB.

*Instead of directing your attention this evening to technical subjects, I choose to discuss, in a practical way, certain elements of success in the chief work for which your training as mining engineers is given. The function of the consulting engineer is very attractive, so dazzling sometimes in its rewards that the chief ambition of young men is to leap suddenly into that select company, only to find themselves handicapped by inexperience, and thereby doomed to failure. To aim at becoming a consulting engineer is well enough, but to become an efficient manager is equally meritorious. The profession of mining engineering enjoys a peculiar distinction; it relates to a business which is fundamental in the progress of the world. The only original sources of wealth are the products of agriculture and mining. All else is man-made; these two are fundamental, pristine, the really indispensable necessities of the human race. To be an intelligent director of such effort, to enlarge the possibilities of successful development in these fields of human endeavor, is certainly an inspiring occupation.

The first and proper aim of the young mining engineer then should be to attain the position of an efficient manager. Let force of circumstances, the renown of your proven ability to obtain practical results lead to the call which shall thereafter make of you an adviser rather than a director. There is honor enough as manager; the ascent to that level is arduous and genuine successes are few. An adequate technical preparation is to be assumed. You are acquiring that here. But experience you are not getting in the University. The magnificent laboratory equipment of our greater institutions today often tricks young men into the belief that they have obtained a ready-made experience; a sort of ready-made garment which they have donned under the impression that it is a sufficient wardrobe for the varied functions of practical life. It is a ready-made garment, and a very good one too. It clothes the nakedness of your theoretical technology, so that you may enter upon the duties of your profession without that crippling sense of shame with which the graduate of 25 years ago was obliged to face the mechanism which he had set out to govern. Moreover it has materially shortened your period of probation. Be thankful for it, but not vain of it.

The engineer today, just as in the past, must start low if he aims high. The short cut is dangerous; it involves a steeper gradient, and your wind may give out before you reach the top. A year or two spent in the commoner work of actual mucking, drilling, machine-drilling operation, timbering, hoisting, mill-repair or construction, boiler and engine tending, amalgamating, furnace feeding, converter operating, and the like, is the best possible preparation for sure and steady promotion. It enables you to learn how things are done, how much a man can do, and what he can not do; it also subjects you to the hard school of discipline, for the best training for the responsibilities of control lies through being governed. This involves absolute respect for the governing power. Do not criticise your manager; work for his interests; conceive him to all intents and purposes to be the company itself; sustain him; help to hold up his hands in absolute loyalty, trusting that he best knows what is for the company's higher interest. Criticism is easy and cheap—the very cheapest commodity. Nothing in human affairs is perfect. Every laborer about a mine or works

is able to see some imperfection, some change which he could make to better things. Let any dozen employees discuss the management, and the combined criticism of the group would argue the manager a very imbecile of incompetency. A new loading bin for stope No. 4 is needed right away; the skips are too small, and any sensible man would provide larger ones; the engine is overburdened, the engine man is sure of that; those jigs are antiquated, and an up-to-date man would put in Wilfleys; the zinc-boxes are too small and the night-solution man doesn't believe the manager ever calculated the ratio of solution-tonnage to the cubic contents of the boxes; and so it goes. But no one perceives, perhaps, that the manager is making the best of his conditions under the limitations of his exchequer. He is working for the grand economic result. He may realize the imperfections in the details more keenly than his critics, and as fast as he can he will remedy them. Trust him, and help him.

Don't seek promotion; let promotion seek you. Many managers regard it as the part of wisdom to discharge a man who clamors for advancement, and the most experienced manager will never promise nor even hint at promotion until the day when he recognizes merit by pushing the man ahead. Seek to be useful, not valuable. The man who seeks to be useful measures his achievements by the standard of excellence of work done; the other applies a monetary scale to his labor, in which his measurement may err. You will be valuable enough if you first become useful. Herein lies the great distinction between meekness and self-sufficiency. It is written, "the meek shall inherit the earth," and it is true. Meekness does not mean monkish self-abasement. It implies the quality of taking your eyes off yourself; in not exalting yourself, but in directing your attention to the honesty and perfection of your performance. The meek man lives for the glory of what he can produce, not for the glorification of himself as an officiously free-willing ego.

Good work is facilitated by composure. You may work swiftly, but do not be hurried. Find that pace at which you can work steadily without excitement, and yet swiftly enough to keep your faculties up to an efficient heat. Finally, keep your philosophy to yourself. Deal consistently in facts, and aim at practical result in a world which esteems most the man who makes his contribution square with reality rather than with theory.

Assuming that you have won your way to the top—for I insist that competent management represents the summit of the range, in spite of the existence of a few more elevated peaks—let us investigate the responsibilities, requirements, and difficulties of the manager. Upon his entry on his duties many obstacles will oppose him. For one thing you may generally count upon some dissension among the members of the board of directors. Strange and inconsistent as it may seem, there will commonly be men among them who would welcome your failure. You have been forced upon them by a dominant majority. They may not go so far as to actually interfere with you, but you may find your policies criticised, and your plans restrained. This you may set down as a reflection of the efforts at compromise and conciliation going on behind the closed doors of the directors' room. The secretary cannot tell you what these men are saying who are making the weather through which you must sail, but study his letters as a shipmaster watches his barometer, and set your course and trim your sails accordingly. At the same time your force at the mine is secretly hostile to you. Some of them may know of the dissension among the directors, and will take pleasure in supporting the minority. There may be a few loyal helpers, but for the most part

*An informal address delivered before the mining students in the University of California on October 2.

men are jealous of each other's successes, and gloat over their failures. These are difficulties on the human or psychological side if you choose, with which the manager has to contend, but which do not disturb the slumbers of his critics, the mine foreman, the mill foreman, the master mechanic, and the rest.

If you are wise the first point to which you will direct serious attention is the mine. It seldom fails that you will have been told that the mine is all right. The difficulty was somewhere else, in the amalgamation, the concentration, the cyaniding, in the roasting of the ore, in the effort to run a too silicious slag. These all may need rectification by your skill and knowledge, nevertheless after correcting patent errors in practice, and starting investigations for metallurgical betterment, subject the mine itself to a severe inquisition. Nine times out of ten you will find that serious misconceptions have been entertained concerning the size and value of the ore-bodies; that development has lagged to such a degree as to threaten embarrassment of the mine's continuous production; that the average value of ore being sent to the works is and has been higher than the average which a legitimate utilization of the available ore reserves would warrant. If suitable assay-records and proper maps exist, study these critically, and take a large number of check samples to insure safety. If necessary, thoroughly re-sample, correct surveys, and re-plot the maps of the mine. For greater convenience in watching the economic results of mining and development, lay out your mine with reference to coordinates, the origin being somewhere just outside of any possible future workings, as for example, to the southwest. Then every point on the mine plans will lie northeast, and can be defined as follows: 3 N 550 E 115 + 21, which would mean that the point in question, from which, let us say, a stope-sample has been taken, is in that horizon of the mine known as Level 3, which extends from Level 3 up to Level 2; that its coordinate is found on the plan of the mine 550 ft. north and 115 ft. east of the origin; and that it is 21 ft. vertically above Level 3. This is a simple system, and by labeling the mine samples accordingly, the assays can be recorded on cards, and filed in a card index, thus maintaining a cumulative record classified in accord with the maps, enabling the condition of any part of the mine to be instantly seen at any time.

The operation of the mine also will require critical investigation. Very often your greatest opportunities for economical reform will exist in the underground operations. Analyze your output per man, per miner, per mucker, per pound of powder, per pound of candles, etc. Get part of your data from the daily reports, and part by personal inspection. Take no man's word for anything of vital import. Find out for yourself. In all industrial activity subordinates are prone to draw a veil over imperfections in their administration, and to make difficulties, delays, and excessive costs seem unavoidable. It is your duty to rend this veil, to reveal the truth. If you have learned the rudiments of your business you will easily strip off this cover of deceit, and win respect because you cannot be fooled. See that you get a rational output in proportion to the men employed and materials used. See that your hoisting appliances are doing proper duty. If you are running more than one shift and your hoisting engine is working below capacity—a common occurrence—see if you cannot concentrate your output within one shift. It is uneconomical, other conditions remaining favorable to concentration of work, to spread your activities thus in either space or time.

Having set your mine in order, scrutinize your prime movers. Take engine indicator cards. Don't take your

engine-man's word about the cards. Take your own. Test your boilers; compare your power costs with well-known standards in terms of fuel equivalents for the two places. Test your air-compressors; your electric motors. Economize your power. Most power plants are operated carelessly and inefficiently, even when the engine-man keeps his brass glistening and his linoleum spotless, and brags about his department. Subject your power-transmission equipment to an equally searching investigation. Be sure that your shafting is in alignment, your bearing-boxes well babitted, clean, and oiled; your belts in good condition and free from slip on pulleys. Examine the mechanism of all machines. Hunt for power-losses throughout your entire works. There scarcely exists a plant in which you will not be abundantly rewarded for your pains. Don't search for curious and fancifully technical ways of showing your superiority. Drive straight for the simple fundamental things. There is the wide fertile field which most men neglect. There is where you will commonly raise your larger crop of betterments. It may be less spectacular than to tear out a quantity of costly machinery and install a new process, but its effects as shown on your balance sheet will carry comfort to that majority in the board of directors which placed you in command, and will emphasize the difference between competent and incompetent management.

Sort over your scrap-heap. At an old plant it will usually prove a mine of wealth. Then take steps to prevent undue additions to it. Under inefficient management the scrap-heap grows like a graveyard during a pestilence, and incompetency is a pestilence; it is highly contagious; it sweeps from the mine-office through all ranks, down to the shoveler on the tailing-dump. Tools become lost, buried in the dirt; pulleys, parts of machines, valves, pipe fittings, bearings, bolts, nuts, are tossed into corners until they obstruct operations, and then the roustabout wheels them to the scrap-heap. The prevention of this waste, and of the indifference which it breeds, is something of a problem. Many otherwise excellent managers fail to solve it. System alone seems not to be entirely sufficient. A well-maintained storehouse system, and a well-placed storehouse are the practical mechanisms for dealing with the matter. This entails adequate clerical aid, which is less often employed than it should be. All tools (except those constituting the listed kits of special foremen, such as those of the engine-man, mill shift-bosses, carpenter, and others), and all supplies of every kind, should be checked out and duly charged, and all 'scrap' should be brought by the roustabout to the storeroom, where serviceable material can be stored, and only the material that is completely ruined will be condemned and sent to the scrap-heap. But even this system will fail in practice, because many articles will be thrown aside and become covered up and lost. To reduce the evil, resort must be had to that spirit of neatness and order which does in fact abide in all men. You cannot develop this by commanding neatness. You must practically render untidiness impossible by making a metallurgical plant as neat and as exquisite as a modern flour mill. A liberal use of linoleum, the closing up of openings to spaces under floors, a proper provision of convenient shells and lockers for articles in common use, the application of paint to machinery, to framework, and to walls, insistence at all times upon scrupulous cleanliness, a general tidying up out-of-doors—'frills,' if you choose to call them by a hard name—will beget self-respect, and freedom from slovenliness, and will prevent waste. Intelligent application of such 'frills' costs very little, and pays not only as a device for material saving, but since cleanly surroundings promote personal cleanliness, so does that in turn

promote cheerfulness of mind, which leads to a higher class of workmanship than is possible in a place that is eternally cluttered and dirty.

I have not touched on the side of technical ameliorations. The fact is that it is not in this field that the manager who is a technical graduate usually fails. If anything, he is too keen to try to ameliorate. He feels that by virtue of being college-bred he is called upon to display his scientific attainments, and he is prone to do so in the most conspicuous place, namely, in the metallurgical department. Improve your extraction by all means. Be progressive, follow the best new leadership in practice, and cautiously blaze new trails if you can; but also apply your higher training as a technologist to the improvement of your power generation and transmission, to the increased efficiency of your compressed-air and electrical equipment, and to the multitudinous mechanical problems which bristle around the mine manager, and which you, with your training, should be able to solve accurately where the empirical workman will make only approximations with his clumsy rule-of-thumb methods.

Upon taking control of a plant, do not assume that its system of operation is either all right or all wrong. Do not express opinions, but investigate. Question every established order. Demand its reason for existence, if there be any. Do not be misled into spasmodic actions, or to the making of snap judgments. Maintain a strictly judicial attitude; collect and test your evidence, and then decide upon the best thing to do. Classify, systematize, organize. Your success in the long run will depend upon your skill in organizing and systematizing. Your science will not save the situation if you have not also these qualities of industrial generalship. But back of these lies the ability to classify, without which you cannot systematize; nor organize the human agents at your command into an effective mechanism for making your system vitally operative. Here you should possess an advantage over any but the very extraordinary empirical competitor.

Classification of the work in and around a mining plant depends, as does all classification, upon your knowledge of relationships, in this case the relationships of the multitudinous duties to be performed. You cannot evolve this out of your inner consciousness, and you cannot systematize the work until you have classified it. In the average plant there is eternal friction between the various departments. The amalgamator is squabbling with the concentrator man, the cyanide foreman has grievances against both of these, the master mechanic is at war with every other departmental head, and everybody wants the scalp of the store-clerk. There is, of course, a certain amount of conflict due to the imperfections of human nature, but one group of men in Amador county, for example, will be very similar to another group at Congress, Arizona. They will work very well if they have proper leadership, and if constant conflict occurs, it is because their duties have not been properly systemized. No matter how pretty the system may appear on paper, if it does not operate well it is because it is not founded on a true classification of duties. The friction is symptomatic. A bad system develops the bad characteristics in a body of workmen because it discourages some, and it offers an opportunity to the more aggressive to overstep their authority in an effort to keep things from going to smash at critical moments.

I knew a young engineer in the wilds of Mexico, in charge of an important mine. He was conscientious, well-trained, and an indefatigable worker, but he could not evolve a workable system. His office used to make

me think of a justice's court. He was constantly hearing complaints, but never succeeded in harmonizing the warring elements. One day the ore-train ran away, jumped the track on a curve and demolished itself in a deep *arroyo*. The alternate locomotive had just gone to shop in a bad state of dissolution, so the plant was closed down for over a month. It turned out that the locomotive engineer, who worked under orders from the master mechanic, also helped in general repair work at odd times. But the mill foreman was privileged to order out the ore-train when there was special need of ore in the bins. This absurd irregularity, incidentally, was due to lack of system in the mine, so that no approximation to a uniform mixture of ore was ever maintained. Hence the quantity of ore milled was a variable, which gave the concentrator men and the cyanide men their own peculiar troubles. On this day the bin was full at 2 p. m. The locomotive engineer was detailed to repair-work on a large pump at the lower end of the plant. The ore was soft and fed out rapidly. At 4 p. m. the mill foreman foresaw a shortage of ore for the night run, and being unable to find the locomotive engineer, he ordered the fireman and the rock-breaker man to take the train to the mine for another load. The fireman's inexperience wrecked the train. The master mechanic and the mill foreman expressed their opinions of each other and of the manager, and resigned. The entire affair, from first to last, cost the company over \$12,000 cash outlay, and the young man lost his first responsible position, with a damaged reputation.

The management of men is partly science and partly art. The science of it lies in what has just been explained—the ability to classify, systematize, organize, and this you can *learn*. The art of it consists in fact.

Set an example of industry, accuracy, honesty, respectability. Never get angry, and never swear. Seek to make yourself understood by clear incisive speech, not to make yourself impressive with bold bad language, nor with caustic humor. Be courteous and agreeable, but not too distinctly affable. I recall a manager who was worthy in many ways, but who erred on the side of excessive affability. As he passed out of the shop one day a workman remarked, "Nice little doggie; see how he wags his tail," and everybody laughed, and in fact this man ultimately failed just because he could not command respect. Do not seek to establish a reputation for being charitable or kind. Nothing is more certain to be misunderstood. Your dependants will set it down as weakness of character, and will take advantage of you. Instead of this, aim at being just. Justice is comprehensible, because it is logical. It has the force of that necessity which inheres in the relation between an effect and its cause. A manager is the representative of what we like to call a soulless corporation. It is in reality a money-making instrument. It was created for that, and for nothing else, and as such it must be administered. In your personal unofficial relations you may give play to your finer feelings, but in your managerial capacity, be the cool calculating judge, and dispense justice.

In your effort to do this you will confront the perplexities of the labor problem. It is only when you meet its organized front that you realize it as a problem. It would not be so very difficult if the problem were all on one side. You think you understand the attitude of the organization; you present what seems to be a solution, based upon the data you had to start with; when lo! you find that you have missed the point utterly. Given certain factors and their supposed relationships, why can you not state your equation and solve it? Because you put only one unknown quantity into your equation, and that is the attitude of the union, whereas you are an

unknown quantity to them, and as each party is dealing with a different unknown quantity you never get the problem stated in mutually satisfactory terms. Every conceivable expedient has been resorted to in dealing with this vexatious difficulty, but where a camp has been unionized you must depend mainly upon tact. Trade unionism has lost responsiveness to the appeal to the instinct for good and efficient performance. Both sides are doubtless to blame for the present situation, but the question of causes is not of particular interest to the man responsible for getting the work done. The concrete fact is that men are now paid, not for the amount or quality of their work, but for their *time*. It is a sad fact that with this leveling downward men have become less responsive to the influences of humanitarian efforts for their material welfare. No better service nor greater devotion to employers seems to follow from the maintenance of good clean barracks, superior food at low prices, reading rooms, swimming pools, and such accessories to agreeable living. The thing that does help, however, is to encourage to the utmost the concentration in your employ of a large proportion of married men. Build them homes, provide them with abundant water, make the conditions for their wives and children comfortable, and make your rentals nominal. This pays. Moreover, it insures you a better class of men; it helps you to restrain evil and drunkenness and rowdiness. The law that "like seeks like" will soon become apparent in the effects. You will find gathering around you those who prefer quiet orderly living; who have self-respect; and such men are always the better workers. If your camp is rowdyish, you can remedy it if you will. And among other things, you must first be the gentleman yourself.

It pays to dress up after work, even in the wilderness. I have seen camps completely reformed in character by this simple expedient. If you do it your staff will soon follow the example, if you hold their respect. Their subordinates will take the hint, and so it will spread. This makes for decency, and respectability, and all the better things that belong in their company. The end of it all is infallibly a larger figure on the right side of the ledger, for respectability in a man's personal relations is reflected in his performance of duty. Perfect gentlemanliness was a characteristic of the two most successful mine managers in the United States; they both carried it with them into the wilderness; they both gave the stamp of their great natures to the camps they developed; they both won the love and confidence of their workmen; they both maintained freedom of labor in their domains. They have shown us how to carry the standards of right and respectability into regions where most men lay aside the principles of progressive civilization. They both have given us examples of stupendous practical success; and throughout their careers they have stood as types of honorable cultured gentlemen. These men are Alexander Agassiz, who made the success of the Calumet & Hecla, and James Douglas, who did the same for the Copper Queen.

In conclusion, allow me to advert to the manager's relations to his employers. As you gain experience you will come to feel that nearly all virtues are necessary in a man to make him loyal, and you will prize it as a jewel of superior worth. Become that jewel for your own company. That is a quality which seldom fails of appreciation. So identify yourself with the company's interests that no division can be drawn between the two. Get the best results you can, and stand or fall with them. Be absolutely frank, absolutely truthful, and remember that while good news will keep, bad news will not. If you have anything disagreeable or unfortunate to tell, hit the psychological moment for telling it, and that moment is

the first one in which you can find time for writing it. If you postpone, the right moment never comes; the delay adds to your embarrassment; gives you another difficulty to explain; and in the end will either warp you into falsehood or put you in the evident position of having for a time tried to deceive. I repeat, the psychological moment for telling the truth, if it be a disagreeable truth, is the first chance you can get. If you doubt this, try it once and see!

Titanium.

Titanium, although generally spoken of as one of the rare elements, is really one of the more common ones. According to F. W. Clarke, chemist of the United States Geological Survey, it forms 0.43% of the surface rocks of the globe, and is much more plentiful than lead, zinc, copper, and other metals classed as 'common.' A great many schists and gneisses carry titanium, and it is found in appreciable quantities in clays—not only surface clays but also those that have been dredged from the sea bottom.

Many iron ores contain titanium, and ores containing 1% or more have generally been avoided by miners, owing to difficulties experienced in smelting, due to thick pasty slags; but it is claimed that when properly handled titaniferous ores give no more trouble with slags than other iron ores. It is said that steel and iron made from iron ore smelted in a blast-furnace running on the titaniferous ores of the Adirondacks took a prize at the London Exhibition in 1851. The addition of titanium to cast iron greatly increases its strength, and an alloy called ferro-titanium is now manufactured at a number of places in this country and Europe for use as an agent by which to introduce the titanium into the iron. It is believed that titanium is used by various firms to increase the tensile strength and elastic limit of steel, and although much secrecy is maintained concerning the matter, it seems probable that some steels that are imported as vanadium steels are in reality titanium steels. As titanium, unlike other metals used for the same purpose, such as vanadium, molybdenum, and tungsten, is plentiful and cheap, its successful use in steel hardening should establish a large market for it.

Several firms are now experimenting with titanium filaments in incandescent electric lamps, but the reduction of titanium to a metal is so difficult that the lamps have not yet been extensively placed on the market.

Titaniferous magnetite and titanium carbide, the titanium of which is derived from rutile, are used as electrodes in arc lamps. When one electrode is made of these substances a block of carbon is used for the other. The best known rutile deposit in this country, the one which produced the greater part of the titanium output in 1906, is at Roseland, Nelson county, Va. A few pounds were produced in Chester county, Pa., where the product is said to occur in comparatively large crystals and to be very pure.

RADIUM IN BOHEMIA.—The growing importance of radium as a therapeutic agent has led the management of the Imperial Uranium Works, in St. Joachimsthal, Bohemia, to construct a special laboratory for the industrial production of radium compounds. The uranium ores of that district contain higher percentages of this element than any other known deposits thus far investigated. The ores and the residues from the uranium extraction have hitherto been treated chiefly at Paris, where the method for isolating the minute traces of radium was perfected. There will be manifest advantages in carrying out the extraction at the place of origin.

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TABLE OF CONTENTS

Editorial:	Page.
Notes.....	565
Lessons of the Crisis.....	566
A Broad Apex.....	567
The Triumph of San Francisco.....	567
General Mining News.....	569
Special Correspondence.....	574
Butte, Montana.....	Cripple Creek, Colorado
Toronto, Canada.....	Goldfield, Nevada
Salt Lake, Utah.....	Denver, Colorado
Johannesburg, Transvaal.....	
Concentrates.....	585
Discussion:	
A Sampler Wanted.....	C. Y. Knight 580
A Suggestion to Road Supervisors.....	E. Moore 580
Ore Depositon.....	George J. Bancroft 580
Professional Customs.....	Norval J. E. Welsh
.....	Ralph Nichols 581
Questions by a Practical Miner.....	W. E. T. 582
Slime Treatment.....	Askni M. Nicholas 583
Articles:	
System of Map-Filing.....	G. N. Pfeiffer 584
A Broad Apex.....	586
Mineral in Underground Waters.....	590
Determination of Fluorine.....	C. A. Heberlein 591
What Happens When Advertising Stops.....	591
Copper in Chloride Solutions.....	Gustave Ferneckes 592
Furnace-Charging.....	G. F. Beardsley 593
A Rapid Calculator.....	596
Mining and Metallurgical Patents.....	595
The Prospector.....	594
Departments:	
Personal.....	568
Market Reports.....	568

Editorial.

SAN FRANCISCO had an earthquake, and now, a landslide. The effects of the physical and the electoral movements are equally vital; both were the expression of a condition of unrest; after both will come a period of readjustment. First came the earthquake, then the fire, now the election. Let us have peace and go to work.

THE PATIENCE of employers is occasionally tried beyond reasonable bounds by the demands of the labor-unions, led largely by foreigners who have just tasted the delights of industrial license. But there is a limit, apparently, and it is a sweet one. The cook of the steamer *Zinfandel* refused to bake jelly-rolls for the crew, so the men walked ashore at Vallejo, leaving the vessel unloaded. The officers of the union at San Francisco refused to uphold the men and sent a new crew to man the boat. Moral: Take pie when you can get it.

FINE-GRINDING has enabled the stamp-mills on the Rand to attain an extraordinarily high duty. Since tube-mills were introduced the average stamp-duty has increased steadily; in January, 1906, it was 5.06 tons; in July, 1907, it was 5.51, that is, 5.51 tons per stamp per 24 hours as an average for the whole of the Rand. The highest duty is recorded by the Glen Deep mill, where it was 7.66; at three more mills the average for the month exceeded 7 tons per stamp. At the same time the use of tube-mills has led to an increased extraction by amalgamation and an impoverishment of the concentrate—a step in the right direction, for the concentrate involves a supplementary treatment.

LETTERS FROM NEW YORK testify to the recent anxiety regarding the financial conditions. When, despite assurances from the bank authorities, depositors stand in long lines for four whole days, there is proof of a scare almost beyond reassurance. The presence of bank messengers among these depositors proved that the anxiety to extract funds was not confined to the ignorant crowd. Bankers consider the situation unprecedented and regard the present collapse of credit as the most serious within memory. Publicly they say brave things in faltering tones, but privately they confess to the imminence of widespread industrial depression. Here in San Francisco the haste to withdraw funds has been checked by the proclamation of holidays, and the desire to put specie in safety vaults has been hindered by the banks and trust companies. In this the authorities are right. Nothing is more anti-social at a time like this than the effort of the individual to safeguard himself, at the expense of everyone else, by withdrawing money for the purpose of hoarding it. If many were allowed to do it,

the financial system would break like an egg under a stone. Self-preservation is truly the first law of nature and of barbarism; the preservation of the welfare of the entire community is the first principle of civilization. The man who tries to grab all the coin available is the enemy of society as organized today; he is as anti-social as Rockefeller.

RECENT REFERENCES to progress at Guanajuato have prompted a protest against the inadequate credit given to the real factors that have counted most in the development of that most important Mexican mining district. We are moved thereby to state that the two elements most influential in making Guanajuato prosperous were electric power and cyanidation. The man responsible for the application of the first of these industrial factors was Mr. Leonard E. Curtis, of Colorado Springs, who organized the syndicate that underwrote the scheme and carried it to a successful conclusion with Messrs. Bryant and McElhiney. On the other hand the application of the cyanide process is due to Mr. E. M. Hamilton, now in Sonora, whose work as a pioneer in a new field of metallurgy, namely, the application of cyanidation to silver ores of a particular character, was so complete as to have proved fundamental and of permanent worth. Honor to them to whom honor is due.

PANICKY CONDITIONS no longer exist in the copper mining industry. The price of the metal has improved by reason of heavy sales in Europe and some of the big producers have unloaded the stocks that have so long menaced the market. Many mines have closed down, especially those based on 25-cent copper and others that were mere lures to speculators; a few large enterprises founded on low-grade deposits are in a bad way and the profits of the best mines have been cut in two, but there is light ahead and while recovery may be slow, it is assured. In the meantime we are glad to say that copper mining in California is in a healthy condition and despite rumors to the contrary, the important mines and smelters are in operation.

A CHICAGO PAPER called *The Mining World* undertakes to lecture our contemporary at New York concerning copper statistics. We thought that was solely our privilege. Apparently the editor of the Chicago paper is a very young man, for he refers to his two seniors, the editor at New York and the present writer, both of whom claim to be under the age limit. Reference is made to an "autocratic system in technical journalistic circles," which must be dreadful—surely a vicious circle of the least mathematical kind. We are told that the *Mining World* was "able to predict with accuracy" that the price of copper would drop just as it did, from which we infer that great wealth has befallen the readers of the *Mining World*, for to be a prophet on such matters is worth while. Although unaware of the present sources of information possessed by the Chicago paper, we do know that for a long time it published weekly the average prices of copper at New York and those prices appeared at Chicago nine days after they had been printed in *The Engineering and Mining Journal*,

and they agreed regularly to three places of decimals. No wonder they were accurate; it was a case of vaticination backwards, even more successful than the present prophetic flights of the same paper. The editor of the *Journal* at that time was so little appreciative of the compliment of having his copper prices confirmed by him of Chicago that he offered to bet with the latter that he could not produce such statistical unanimity by giving figures a week sooner, that is, before the *Journal* could reach Chicago. Hence the humor of the cool self-complacency of the *World's* comment on "autocracy in journalistic circles."

Lessons of the Crisis.

NOW that the storm has overwhelmed some of the unseaworthy craft launched during times of excitement, there is every inducement to moralize. The same cycle of events is recorded at recurrent intervals and mankind profits as little by the mistakes of the past as the son learns from the teaching of his father. Each gets his own experience, and it is a lamentably costly process. If experience were cumulative, we would be as demigods, for ours would be the inherited and transmitted knowledge of all the generations precedent. But it is not so. Each burns his own fingers to find out that fire is hot; each loses his own money in speculation to find out that greed is punishable. Lucky, and truly sane, is the man who permits one lesson to suffice.

Is it worth while to castigate the wrong-doing of a boom that is past? Yes, if such treatment teaches anything and serves to guide us in the future. For booms will come again, as surely as industrial depression comes now. Some of the happenings of the past two years have been discussed in these columns. Among them we spoke regretfully of the widening of financial responsibility on the part of men like Messrs. Cole and Ryan, insisting that even unusual executive ability becomes impotent if spread over too many enterprises, the reputation of such men becoming simply a lure for the unwary. The Greene-Cananea episode is to the point. This is a sad fiasco, the result of self-confidence and over-speculation. F. Augustus Heinze has been broken, and the bank too—a gambler's fate. He took the Senator Stewart mine in the Cœur d'Alene when it had \$15,000 profit in ore reserves and used his reputation to sell shares at New York at an initial valuation of \$2,500,000. Much in the same way Charles M. Schwab used his notoriety to sell shares in the Montgomery Shoshone and other mines in Nevada of much less worth at enormous capitalizations. Patsy Clark, of Spokane, had his Furnace Creek property selling actively at a valuation of \$4,500,000 at one time, when it consisted mainly of a few holes in the ground and strong copper stains, while Cole & Ryan bought a prospect for \$2,250,000, sold it to their friends at \$5,000,000, and pushed it to a market valuation of \$34,000,000; and while it was selling at that figure they effected a consolidation with the Greene property and passed a lot of the combined stock to their friends as a bargain at a valuation of \$60,000,000. It is hard to believe that any of these transactions were made in good

faith. They show the willingness of financiers to attach their names to a gold brick whenever money is to be made by the sale of it. The whole atmosphere of mining finance is heavy with a kind of business that enriches a few, debauches many, and impoverishes most. There is enough legitimate business for everyone; mining does not thrive on chicanery.

The Triumph of San Francisco.

SAN FRANCISCO is vindicated; she has come victoriously through a trial more severe than an earthquake, more searching than a fire. The result of the election proves that the good sense of the people will make itself felt in times of crisis, despite the shouting of demagogues, the trickeries of politicians, and the impudent leadership of a putrid press. The call to civic decency has been answered, the cause of representative government has triumphed. The people of San Francisco, the citizens of no mean city, can afford to shake hands in congratulation, and the people of this State as a whole may salute the dawn of a better day, which presages the overthrow of the influence that has so long overshadowed the fair destiny of California. We mean the Southern Pacific railway, a corrupting tyranny that for thirty years has throttled every effort at civic and industrial freedom in this Commonwealth. You can fool many of the people most of the time, because they are too busy about their own affairs, but once in a while the intelligence of a democracy is awakened by a noble purpose, and then it is irresistible as a full tide without sound or foam that sweeps all the flotsam and jetsam of the shallows of politics high and dry.

It is fine that Dr. Edward R. Taylor should be elected to the office into which he stepped at a time of stress, and it is gratifying to see the big majority given to the District Attorney. But the cause was bigger than the men, as is always the case in great movements of public opinion. San Francisco voted for municipal housecleaning and for an end to the corruption that has defiled every one of her industrial activities for the last four or five years. The City voted for the completion of the work of the District Attorney in prosecuting the boodlers and bribers; she has endorsed her advocate, Francis J. Heney; she has honored a man of rare public spirit, Rudolph Spreckels.

The results here and at New York indicate that W. R. Hearst has brought disaster to the causes he supported. It means the end of his sinister influence in American politics. For this let us give thanks. There is reason to hope that the manhole of a sewer will be closed ere long and that the prostitution of journalism will be made unprofitable. The election here proved the utter impotency of the press. It is doubtful if any man gained from newspaper support; most of the candidates lost by it. Even some of the papers most loud-spoken for good government sold their pages to the advertisements of the opposition, and others that advocated the election of Dr. Taylor advised their readers to vote against the District Attorney, making it perfectly evident that they were

supporting the enemies of the City and the cause of corruption in high places. The press has ceased to be a power in politics even for evil, because it is insincere, when not frankly venal. The influence of the intellectually dishonest in daily journalism is on the wane. They have been found out. So much the better. There is a time coming when the community will recognize that an intelligent and fearless newspaper can exert more influence than a university and reach more people than a church. That is one of the lessons of the day.

The immediate result of the election is to restore confidence in the destiny of San Francisco. All over the world it will be known that good government has won. Locally there is now an incentive to go forward cheerfully with reconstruction. Scores of important contracts, held back by a proviso that they were to be annulled if the election went the wrong way, will now be carried out without further hesitation. The city has stood the test of earthquake, fire, and political pestilence; from each she has emerged with unconquerable spirit and undiminished hope; serenely San Francisco stands fronting a noble future, the mists are clearing, the air of the high altitudes stirs her banners, and overhead is the perfect blue of a California sky.

A Broad Apex.

IN our issue of August 17, of the current year, there was presented a brief comment upon the then state of decision on the subject of 'broad apex' and extra-lateral rights on broad lodes or bisected apexes. It was there noted that these questions were then pending for determination in the Supreme Court of the United States in the case of *Lawson v. United States Mining Company*, involving a broad vein in a limestone belt in the Bingham district of Utah. That Court handed down its decision on October 21. The matter being of great importance to the mining industry we deem it proper to publish the decision in full, as we do on page 586 of this issue.

We have prepared a diagram showing the relative position of the properties involved, which will be of material aid in reaching a correct understanding of the facts and the law applied to them. The following important principles are settled by this decision:

(1) Where there is more than one location on a broad vein, the apex of which extends laterally over the width of two or more locations, the senior locator takes the entire width of the vein on its dip, leaving to the junior claimants only surface rights.

(2) A failure to adverse an application for a lode patent is a waiver of any right to conflicting surface areas, but does not prevent the subsequent inquiry as to which of two claims were prior in point of time, where the underground or extra-lateral right of the respective parties becomes alone involved.

(3) In determining the question of priority, proceedings antedating the entry and patent, for example, the date of discovery and location of the respective claims, are proper subjects of inquiry. This is not a collateral attack on the patent.

Personal.

W. M. BREWER is at Tonopah.

MARK L. REQUA is at New York.

HENRY BRATNOBER is at Seattle.

H. H. WEBB was at Cobalt lately.

E. RENSIAW BUSH is at Pittsburg.

JOHN B. FARISH is at the Fairmont hotel.

JOHN HAYS HAMMOND is at Santa Barbara.

E. A. WEINBERG has returned to Melbourne from Queensland.

H. N. O. SPICER, of London, is visiting Goldfield and Tonopah.

R. K. ESTOP is engaged in dredging work at Oroville, California.

F. F. SHARPLESS is examining a gold mine near Boise City, Idaho.

W. C. PATERSON has left Mogollon, New Mexico, and is now at Denver.

JOHN HERRON, formerly at Telluride, Colo., is now at El Oro, Mexico.

T. S. MATHIS has returned from examining mines in southern Oregon.

C. C. SMITH, of Reno, sails on November 12 on the *San Juan* for Costa Rica.

GEORGE GUNN, of Ely, was in San Francisco this week; he is now at Salt Lake.

LLEWELLYN HUMPHREYS has been examining mines in Siskiyou county, California.

D. W. SHANKS is general manager for the Rio Plata Mining Co., in Chihuahua, Mexico.

HENRY F. LEFÈVRE is at New York, on his return from Mexico. He will be at Denver shortly.

R. L. ARMIT has been appointed superintendent of the Pinguico mine, near Guanajuato, Mexico.

A. G. COLE is assistant engineer with the Pittsburg-Silver Peak Gold Mining Co., at Blair, Nevada.

JAMES T. GRIBBLE has been appointed superintendent of the Channel mine, in Nevada county, California.

GEORGE G. LYLE, of Guadalupe De Los Reyes, in Sinaloa, is investigating milling methods in Colorado.

HERBERT R. HANLEY is assistant superintendent for the Bully Hill Copper Mining & Smelting Co. at Winthrop, California.

ALFRED JAMES has been elected president of the Institution of Mining and Metallurgy. He arrived at New York by the *Lucania* on November 7.

JOHN E. ROTHWELL has returned to Denver from Inde, in Durango, Mexico, where he has been for some months installing a 100-ton cyanide plant.

H. A. HORSEFALL has opened an office, as mining and mechanical engineer, at 69 Wall St., New York. He was formerly in Mexico, and was connected with the Government land surveys.

MARTIN FISHBACK and HENRY SCHMIDT, of El Paso, Texas, have formed a partnership to conduct a chemical and metallurgical laboratory, to be in charge of Mr. Schmidt, Mr. Fishback still maintaining his office as mining engineer.

THE friends of GEORGE WILSON are anxious concerning him, having no news of him for six months. He left London early this year, and is the lessee of mining lands in Russia. He was formerly in Mexico, and is a tall Scotchman, with white clipped beard. Communications addressed to the Editor will be transmitted to his friends.

Dividend.

On November 4 the Bunker Hill & Sullivan Mining & Concentrating Co. paid dividend No. 122 of \$120,000. This makes the amount of dividends paid since January 1 \$1,860,000, and the total to date, \$9,726,000.

Latest Market Reports.

LOCAL METAL PRICES—Nov. 7.			
Antimony.....	13@17c	Quicksilver (hask).....	\$45.50
Copper scrap.....	16@17c	Spelter.....	7@ 7.75c
Pig Lead.....	4.85@ 5.80c	Tin.....	40½@42c

ANGLO-AMERICAN SHARES.			
Cabled from London.			
	Oct. 30.	Nov. 6.	
	£. s. d.	£. s. d.	
Camp Bird.....	0 17 0	0 17 3	
El Oro.....	1 0 6	1 1 3	
Esperanza.....	1 13 9	ex div. 1 12 6	
Dolores.....	1 0 0	1 0 0	
Oroville Dredging.....	0 14 6	0 14 0	
Stratton's Independence.....	0 3 3	0 2 9	
Tomboy.....	1 6 3	1 6 3	

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

METAL PRICES.				
By wire from New York.				
Average daily prices in cents per pound.				
Date	Electrolytic Copper	Lead	Spelter	Silver
Nov. 1.....	14¼	4¾	5.28	59¼
" 2.....	14¼	4¾	5.23	59½
" 3.....	Sunday.	No market.		
" 4.....	14¼	4¾	5.18	60½
" 5.....	Legal holiday.			
" 6.....	14½	4¾	5.13	60¾
" 7.....	14½	4¾	5.13	59¾

MINING STOCK QUOTATIONS—NEW YORK.		
Closing Prices.		
	Oct. 30.	Nov. 6.
Bingham Central.....	½	¾
Boston Copper.....	12¾	12½
Cumberland Ely.....	5½	5½
Dolores.....	5	5½
El Rayo.....	2¼	2½
Guanajuato Con.....	2½	—
Giroux Con.....	3	3¾
Greene Cananea.....	6½	4
Nevada Con.....	7	7½
Nipissing.....	6	6½
Tennessee Copper.....	21	24
Tonopah Ex.....	1½	1¼
Tonopah-Belmont.....	1½	1½
Tonopah.....	8¼	7¾
United Copper.....	23½	8¼
Utah Copper.....	16½	17½

(By courtesy of Hayden, Stone & Co., 25 Broad St., New York.)

SOUTHERN NEVADA STOCKS.		
San Francisco, Nov. 7.		
Atlanta.....	\$ 23	Laguna..... 75
Belmont.....	91	Manhattan Con..... 30
Columbia Min.....	20	Midway..... 43
Combination Fraction.....	91	Mizpah Extension..... 10
Daisy.....	73	Mohawk..... 8 87
Fairview Eagle.....	70	Montana Tonopah..... 1.42
Florence.....	2.55	Nevada Hills..... 2.60
Gold Bar (Bullfrog).....	35	Red Top..... 3.00
Goldfield Con.....	3.95	Sandstorm..... 20
Goldfield of Nevada.....	1.10	Silver Pick..... 25
Gold Kewanas.....	28	St. Ives..... 36
Great Bend.....	28	Tonopah Extension..... 1.10
Jim Butler.....	45	Tonopah of Nevada..... 7.50
Jumbo.....	3.00	Tramp Con..... 18
Jumbo Extension.....	71	West End..... 36

(By courtesy of W. C. Ralston, 368 Bush St.)

COPPER SHARES—BOSTON.		
Closing prices.		Closing prices.
Nov. 7.		Nov. 7.
Adventure.....	1	Michigan..... 9½
Ahmeek.....	48¼	Mohawk..... 46
Allouez.....	23	Nevada Con..... 7
Amalgamated.....	48½	North Butte..... 40
Arcadian.....	3	Old Dominion..... 22½
Atlantic.....	10	Osceola..... 81
Balaklala.....	3¾	Parrot..... 10½
Bingham Con.....	6¼	Phoenix..... 50
Boston Con.....	11½	Quincy..... 79
Butte Coalition.....	14½	Raven..... 82
Calumet & Arizona.....	106½	Rhode Island..... 2¾
Calumet & Hecla.....	605	Santa Fe..... 2
Centennial.....	20½	Shannon..... 10¼
Con. Mercur.....	25	Superior & Pittsburg..... 9¾
Copper Range.....	53½	Tamarack..... 63
Daly-West.....	10	Trinity..... 11½
Franklin.....	7½	United Copper com..... 7½
Granby.....	80	Utah Copper..... 17
Greene-Cananea, etc.....	5¼	Victoria..... 4½
Isle Royale.....	15½	Winona..... 2½
Mass.....	2¾	Wolverine..... 108

General Mining News.

ALASKA.

It is reported that the employees of the Hadley smelter have attached the smelter for wages. The plant has been in the hands of a receiver for over a month; he states that the men will be paid as soon as returns from the ore shipped to the Tacoma smelter can be had.—The Porcupine M. Co., near Juneau, has closed down for the winter; about 40 men work at the mine. All have left for the United States except two or three, who will remain as watchmen.—The property on which the City of Nome is built has been sold to the Sinook M. Co. Several leases have been given by the company on ground near Snake river, but beyond the city limits.—West and McNeil have left Teller for the Ears Mtn., taking an outfit with which to begin work on their tin prospects in that district.—Considerable mining will be done this year in the vicinity of Solomon; boilers have been taken to several of the claims to aid in this work.—P. A. Dickson and Paul Assmuss will soon begin operations at the Dorah bench, near the mouth of Nome river, at the place where they worked toward the end of last winter.—The Allene M. Co. intends to do considerable prospecting on their claims along Allene creek; they will also do some mining, as pay-gravel has been found on these claims. Several boilers and a large outfit have been sent to the mines and all preparations have been made for the winter work.—Considerable prospecting is predicted this winter between Cape Nome and Nome river. Nome river is now frozen over at its mouth.—The Leland dredge is still operating at Solomon; the frost has not interfered with the work as yet.—A \$600 nugget has been found on Homestake creek, which is on the east slope of the Sawtooth range and some distance below Salmon lake.—It is estimated that the output of the Fairbanks district will be larger this year than last.

ARIZONA.

COCHISE COUNTY.

A two-foot vein of copper-bearing sulphide ore has been found on one of the claims in the Ophir group, near Paradise.—The Duluth-Chiracahua Co. has two men working at the Copperopolis property doing the assessment work.

The new orebodies recently found in the Lucky Cuss and Emerald mines still look well.—All the mines at Tombstone are working with their usual forces.—The 200-ton mill of the Tombstone Consolidated M. Co. was shut down one day last week for repairs.

GILA COUNTY.

The Arizona-Colorado Co. will resume work about the end of the month. The shaft at this property is 700 ft. deep and several veins were cut in it. The lode, which the shaft cut at a depth of 150 ft., is 40 ft. wide. It is planned to sink the shaft another 100 ft., as the returns from the first and only shipment of ore from this property were quite satisfactory.

The output of the Old Dominion smelter for October was a little over 4,000,000 lb. of blistered copper, which is the record at this smelter. All five furnaces were in commission at the first of the month but, when orders were received to curtail, one furnace was discontinued and later another so that now only three furnaces are in operation. Beginning with this week the Old Dominion will work six days instead of five as was at first the intention.—The members of the Globe Miners' Union held a special meeting last Saturday and although no official information was given out it is understood that the majority voted to accept the reduction of 50c. per day provided a 6-day week was worked.

GRAHAM COUNTY.

Perry & Spence, who are working a lease on the Laura mine in Steeple Rock district, continue to ship ore to the Shannon and Copper Queen smelters. The new orebody found in the raise on the 300-ft. level is producing a good deal of shipping ore.—A number of men are working at the Mascot mine near Safford. The shaft will be sunk 50

ft. deeper.—J. F. Cleaveland has been elected president of the New York-Arizona Gold & Copper Co.—The Standard, Copper Center, and San Jose claims at Morenci are looking well; the Copper Center and Standard are shipping copper ore to the Dominion Copper Co. smelter, while the San Jose makes occasional shipments of silver-copper ore to Douglas. The aerial tramway at the Standard is working well; the ore in the lower workings at the Standard is not nearly as rich as the ore near surface.—The vein at the Buzzard Shadow claim still is looking well. This vein occurs along the contact of a porphyry dike with quartzite and is parallel to the old Buzzard Shadow vein which follows the other side of the dike.

MOHAVE COUNTY.

Work at the McKesson mine is at a standstill owing to the failure of the pump to arrive. A good vein of gold ore had been struck in the bottom of the shaft when the water-course was cut.—F. P. Andreas has made the second payment to S. A. Tyler on the purchase price of the Golden



Map of Arizona.

Eagle group of claims on Cerbat range above old Canyon station. Mr. Andreas has been working these claims for several months with quite encouraging results.—The directors of the Gold Road Co. have decided to sink the main shaft to a depth of 1,400 ft.; it is at present 800 ft. deep.—The McCracken mines have been sold to the Western Development Co. of Chicago.—The cross-cut from the bottom of the shaft at the P. K. mine in I X L basin has been in good lead ore for 8 ft., but as yet there is no sign of the other wall. H. W. Bowen is manager of this mine.

PINAL COUNTY.

The Kelvin-Calumet Co. will continue to work in spite of the low price of copper.—The Ray mine and mill has been shut down; about 300 men were working at this property.

YAVAPAI COUNTY.

The new cyanide mill at the Parker group of mines, on Turkey creek, belonging to the Buffalo-Arizona Mines Co., is working successfully. It is planned to do considerable development work at the mine this winter.

CALIFORNIA.

EL DORADO COUNTY.

The gravel recently found in the drift from the shaft in the mine belonging to the Prevolcanic Channel Gold M. Co. at Pacific is quite rich but its extent is not known. It is stated that the company prospected this property owing

to notes in one of the U. S. Geological Survey reports, which indicated that the channel was somewhere near this point. Gold-bearing gravel had already been found in one of the holes drilled near where the shaft was sunk.—The Mt. Pleasant mine and the Eagle mine, both at Grizzly Flat, have been sold. The recent purchasers of the Still-wagon are preparing to stope some ore and test it in the 5-stamp mill which is on the property.

MONO COUNTY.

Two groups of claims in the Sunny Jim district have been sold by J. W. Duval; the Florence, Masonic, Queen, Scott, Alexander, Tyler, and Hamilton claims have been sold to the Tyler Gold M. Co., while the Sunny Jim M. & M. Co. has bought the Optimo, Sunny Jim, Jupiter, Satellite, Chicago, and Missing Link claims.

NEVADA COUNTY.

The new company, which has purchased the Lincoln property, on Little creek, has begun to build a shaft-house at the property.—The 20-stamp mill at the Yuba mine, near Maybert, is running full time. Ten of the stamps are crushing ore from the Yuba mine and the other ten crush ore from the Mayflower mine. The company has decided to build two miles of new flume which will deliver water at higher head and so provide more power.

Work has begun at the Belle Union property. A drainage adit to be about 300 ft. long is being driven to catch the vein at a greater depth.—Work on the 10-stamp mill at the Ancho mine, near Graniteville, is progressing rapidly; it is expected that the mill will be finished within three weeks. The mine is developed by two adits. The longer adit, which is 700 ft. in length, is being put in shape for active work. H. W. Overmann is in charge.—The Mayflower mine at Canada hill, owned by W. H. Martin and others, has been bonded to W. G. Motley. Working on the property will begin about the first of the year. There is a 20-stamp mill on the property. The mine has not been worked for several years.

PLACER COUNTY.

(Special Correspondence.)—The 2-stamp mill for the Rubelin mine, in Last Chance ravine, has arrived and will be installed immediately.—Savage & Warden have five men at work on the Three Queens mine in Volcano canyon. They are retimbering the mine, straightening drifts, and preparing for systematic development during the winter.—Mr. Drummond is cross-cutting the old channel at Georgia Hill near Yankee Jim; the gravel is said to be of good grade.—Tom Browne is having a mill-test made on gravel from the upper channel of the Paragon mine. The lower channel at this old mine paid well in early days, and apparently the mine will again become a good producer.—The old Gaylord drift mine, about 2½ miles below Auburn, is being reopened; this mine is on the Forest Hill channel and has been mined in a small way for years, but the pay gravel has been quite spotted heretofore. Auburn, Nov. 3.

The 10-stamp addition to the old 10-stamp mill at the Holy Cross mine on the American river, near Towle, has been completed and the mine is now ready to operate.—Work is progressing at the Hidden Treasure, Eureka, Mameluke, and Jupiter drift mines.—At the Buckeye and Slope mines 80 men are working.—The Downing drift mine, near Towle, has been bonded. It is opened by a 600-ft. adit. This mine is north of the famous Mountain Gate mine, and it is thought that the same channel goes through it.—The Big Giant Co. is cleaning out and retimbering the old adit on that property.

PLUMAS COUNTY.

The gravel at the Bellevue drift mine between La Porte and Gibsonville is yielding good returns. There are 19 men working at the mine.—The Reno men who were working the Arcadia mine, three miles north of Greenville, have given up their bond on the property owing to the present money stringency. The owner, D. M. McIntyre, has continued the cross-cut, which was being run by the Reno people, and has cut a low-grade vein eight feet wide. This cross-cut will be driven another 50 feet.

SHASTA COUNTY.

Work at the Niagara mine in the French Gulch will soon be resumed.—The Keswick furnace of the Mountain Copper Co., which has been running only a short time, has been shut down. This does not affect the main smelter of the company, which is at Martinez. The Gold Leaf mine is working a full force of men; the Milton and the Brackett mines are also working.—The ore from the Golinsky mine at Kennett is being shipped to the Guggenheim smelter at Garfield, Utah.

SIERRA COUNTY.

Soft rock has been struck in the South Fork gravel mine at Forest, and it is expected that the channel will be cut in a few days.—A contract has been let to drive a lower adit at the Australia quartz mine in Slug canyon and work has begun. Good ore has been found in the upper adit. The mine is owned by Gov. Sparks of Nevada and Richard Phelan.—The Kate Hardy mine, near Forest, has been bonded by Tyler Dudley to a San Francisco company.

TUOLUMNE COUNTY.

At the Ellen Winton mine the east drift, which was started a short time ago, is looking well. The mill is running steadily. T. J. Crowley of San Francisco is owner of the mine.—At the Kanaka mine the installation of new machinery has been commenced. The mill is not completed as yet.—The shaft at the Kennedy mine, which is now 3,100 ft. deep, is to be sunk another 200 ft. Much of the ore coming from the lower levels of this mine is said to be richer than that from the upper levels.—The lawsuit in regard to the 10-stamp mill at the Arbona mine, near Tuttletown, has been decided in favor of the Calmas company. In watering of the mine will begin shortly; the mill is being repaired. R. B. Lucas is superintendent.—The owners of the Pattison mine at Tuttletown have taken possession of the mine, claiming that the Pyrenees Mining Co., which had it bonded, has not lived up to the bond.

COLORADO.

CLEAR CREEK COUNTY.

(Special Correspondence.)—What is considered to be a good strike has recently been made by Graham & Anderson in the Columbia mine. They have a 5-in. streak which pans high in gold, and the free-gold specimens, which they have found, are encouraging. This strike was made on the 85-ft. level. The Jackson concentrating mill, of which J. G. Roberts is manager, is working night and day; it treats about 80 tons per day. An improved King screen is being installed.—The Red Elephant near Lawson has recently been started up by Pennsylvania men under the management of W. L. Shaffer. The property was operated for some time by A. E. Reynold of Denver, and has been a large producer in the past.—The Stanley Mines Co., of which Harry J. Wolf is superintendent, will soon resume, as the litigation, which has tied the mine up for the last two years, has been settled. The company will unwater the lower workings and then begin to do development at depth. It is their intention to install an up-to-date concentrating plant to treat the ore in the stopes of the upper levels. There is a large tonnage in these stopes which can be milled at a profit; much of this is cobbings from the high-grade ore which was shipped years ago. It also intends to install a new power-plant on Clear creek to utilize the water-power which the company controls. A steam-plant will also be installed in connection with the water-plant which they can operate when the water is low. The power-plant will probably develop about 1,000 hp.; the plan is to use compressed air transmission to deliver the power to the Stanley property and other mines in the vicinity. The Stanley mine is equipped with a 16 by 42 double-cylinder hoist good for 2,000 ft., which will be operated with compressed air. The air will be reheated before it enters the cylinders in order to increase the efficiency. The two-compartment incline shaft is 800 ft. deep; it is believed to be in good condition, although it has not been used for some time. The main adit has recently been retimbered and 25-lb. rails laid. The company now owns 76 lode claims, 10 placer claims, and three millsites, all

patented, which cover veins three and four claims wide for a distance of three miles along the strike. The estimated production of this mine has been about \$3,000,000. Not over 10% of the ground has been thoroughly developed. A. G. Brownlee is president.

Idaho Springs, Nov. 2.

IDAHO.

IDAHO COUNTY.

The famous Big Buffalo mine, in the Buffalo Hump district, is reported to have been sold by Charles Sweeny of Spokane to the Guggenheims. This sale includes not only the Big Buffalo but also the Vesuvius mine near Callender and a number of claims in the Buffalo Hump district, as well as all the water-rights belonging to Charles Sweeny in that district. The Big Buffalo mine has paid \$375,000 in dividends. While the surface ores yielded about 50% of the gold on the plates, in depth it becomes base; it was this

the Bradley people have bought the Buster mine at Elk City considerable activity has been shown at the mines in that vicinity.—The crushers at the Buster mill were run last week and considerable rock for the concrete foundations in other parts of the mill was crushed. The work on the mill is progressing rapidly, the building itself is completed and they have begun to erect the cyanide tanks. Considerable of the machinery has been already installed and it is expected that the mill will be running by the end of the month.

OWYHEE COUNTY.

The Sonnemann properties on South Mountain have shut down for the winter as it is impossible to get the necessary machinery to the mines before next spring. This property is to be operated under a working bond.—The grading for the tramway at the Banner mine has been completed. Work on the 30-ton mill has been delayed somewhat by recent rains but is progressing again. This mill will consist of Nissen stamps, concentrators, pans, and settlers. At the mine the north and south drifts from No. 2 level are developing about the same grade of ore as in No. 1 level. In the north drift on No. 4 level, which is now 600 ft. long, the ore is steadily improving. The vein at the Banner mine averages 5 ft. in width, and carries from \$5 to \$30 per ton in gold and silver. This mine is about 3,000 ft. west of the famous Trade Dollar mine in Long Gulch, near Silver City. —The Potosi mine at Silver City is looking so promising that the company is putting in the foundations for a mill which they intend to build next summer. The Potosi was operated quite successfully several years ago; at that time one mill-run of 30 tons gave \$100 per ton in gold and silver. There are three distinct veins in this property; on the Potosi vein the inclined shaft is 200 ft. deep, but the vein has been worked out by old operators above the 100-ft. level. On the 200-ft. level the ore-shoots are much longer than they were on the 100. The conditions on the 200-ft. level indicate that the ore will continue much deeper. As this 200-ft. level is deeper than the 1,700-ft. level of the Trade Dollar, this fact is quite encouraging to the district as a whole. The south drift on the Potosi vein of the 200-ft. level is 465 ft. long and carries a total length of 315 ft. of ore-shoots that vary from 6 in. to 3 ft. wide. The north drift on No. 2 level is 317 ft. long and has cut 160 ft. of ore along the Potosi vein and 60 ft. of ore along the Knickerbocker vein. The company has started to sink the main shaft 200 ft. deeper.

WASHINGTON COUNTY.

A body of rich copper ore has been found in the Boggs lease in the Peacock mine in the Seven Devils district. This orebody is 20 ft. wide and will help to greatly increase the tonnage of ore which is being shipped to the Sumpter smelter. Twenty miners are working on the lease at present, but the force is to be enlarged. At the Lockwood group G. W. Bogg has several hundred sacks of ore awaiting shipment.

MICHIGAN.

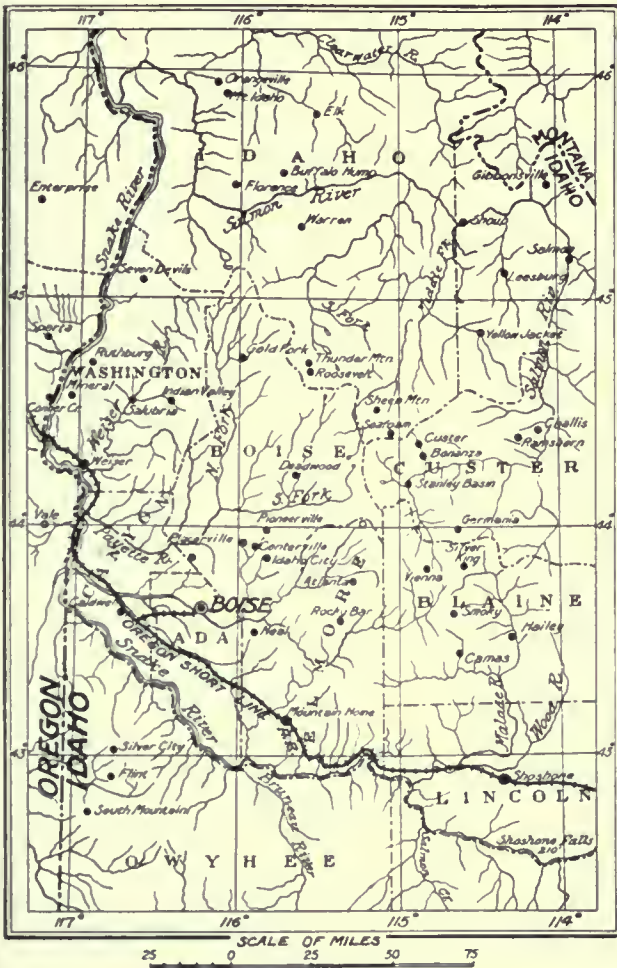
IRON COUNTY.

The Verona Co. is sinking an exploratory shaft about half a mile east of the Calumet mine in section 9. The shaft is 135 ft. deep. At a depth of 150 ft. cross-cutting will begin. The ore cut by the shaft is quite low-grade. In Atkinson township the company is sinking another shaft and installing machinery, hoisting engine, and air-compressor. The company has assumed the Coe-Piper lease on the Buchholz exploration in the Iron river district. The shaft is to be enlarged and sunk deeper. This property adjoins the Beta mine of the Mineral Mining Co.—In the Amasa district the Iroquois Iron Co. has developed a large body of low-grade ore. Boilers, hoisting engines, compressors, etc., are being installed and a shaft-house and other buildings erected.

NEVADA.

ESMERALDA COUNTY.

The out-put of the Goldfield mines for the week ending November 1 was 3,731 tons having an estimated value of \$348,600. This represents the ore sold to the samplers or treated in local mills; considerable other ore was mined but stored at the mines. The Nevada Goldfield Reduction



fact which caused the shut-down of the mine in the spring of 1903. The Big Buffalo vein is 50 ft. wide on the 65-ft. level. A 10-stamp mill is on the property. It is also reported that a railroad will be built into the camp so that the ore can be shipped. The Buffalo Hump ore would make a good flux for the silicious ores of Nevada. In case a railroad is built into that district the mines about Warren will take on a new life. The base character of the ore has caused the Concord, the Crackerjack, and other mines in the Buffalo Hump district to close down, although they have good bodies of ore developed; without means of shipping the ore these mines cannot at present be worked.—Near Elk City, Leslie Belor, Herman Brown, and James Murphy have found a 6-ft. vein of good ore at a depth of 15 ft. in their Center Star group, which is an extension of the South Fork group. The vein has been exposed by open-cuts for a distance of 600 ft. The South Fork group was located last spring; it is also called the Espey mine. The crude 2-stamp mill which the owners have erected on that mine has paid them quite well this summer. On account of this success at the Espey many locations have been made in that vicinity.—Since

Co. refuses to receive any ore until the smelters are willing to settle for the ore within a reasonable time; the mines shipping direct to the smelters had to curtail or else stop shipments for a similar reason. The Western Ore Purchasing Co. continues to receive ore from those willing to wait for a settlement. The shipments were as follows: Florence L. & M. Co., 46 tons; Rogers-Goldfield Syndicate, 90; Mohawk Combination, 768; Combination mine, 50; Mohawk mine, 834; Begole lease, 390. The Combination mill treated 560; the Kinthead mill treated 140 tons of Red Top ore.—The Little Florence did not market any ore last week, only a limited amount was mined at the Mohawk, while Mohawk Jumbo, one of the largest producers, is shut down pending the settlement of the boundary dispute.—The John S. Cook & Co. bank reopened a week ago last Monday, but the Nye & Ormsby bank and the State Bank & Trust Co. remain closed. There was no run on the Cook bank; it is announced that the other banks will reopen soon.—The Goldfield Consolidated Mines Co. has declared a second monthly dividend of 10c., payable November 25. The Consolidated expects to lease the 50-stamp mill at Olinghouse near Reno. This mill has a capacity of about 250 tons per day. The shaft at the Little Florence has been completed and the station at the 500-ft. level is being cut. The vein is widening where it is developed on the 400-ft. level. The lease is producing its usual tonnage, but this is being piled on the ground instead of being shipped.—The shaft on the Albemarle property, controlled by James F. Burns of Colorado, is to be sunk to the 500-ft. level; stations will be cut every 100 ft. and the vein prospected. The cross-cut on the 100-ft. level has been cleaned out and is being driven ahead.—The shaft on the Codd lease on the St. Ives property is being sunk deeper.—A rich cross-vein, 12 to 24 in. wide, has been found at the Daisy mine at Diamondfield in a cross-cut on the 210-ft. level.—The orebody in the Rogers-Syndicate lease still looks well; stoping has begun on the 409-ft. level. The cross-cut has passed clear through the first vein on that level and is being continued to catch the parallel vein found on the 300-ft. level.

NYE COUNTY.

The Wolf mill at Manhattan began to crush ore November 2. Miners are stoping the ore on the 100-ft. level of the Manhattan Consolidated in order to supply this mill with ore.—November 1 the last spike of the Tonopah & Tidewater railroad to Beatty was driven. The new road connects at Ludlow with the Santa Fe railroad. The grades on this road are said to be quite light and the distance by rail from Tonopah to Los Angeles is shortened 90 miles.

The Montgomery Shoshone mill is now running full capacity and a high extraction is being reported. Shipments to the Salt Lake smelters continue at the rate of 30 tons per day.—Development work is being hurried at the Homestake mine. The drift on the 500-ft. level, which is in ore, is being driven ahead rapidly; the north drift on this level is 130 ft. long and the south drift 100 ft. On the 400-ft. level the north drift is 400 ft. long and the south drift 300 ft. A connection has been made from the Homestake with the King mine; this drift is 1,200 ft. long and was driven mainly for ventilation. Sinking has stopped, and instead the orebodies already discovered are being blocked out. No sulphides have appeared in the ore as yet, but some patches of sulphide ore are found occasionally in the country rock.—At the National Bank the east drift on the 3-ft. vein, which was intersected by the cross-cut on the 400-ft. level at a point 225 ft. north of the shaft, is now 40 ft. long. The ore in this vein is of good grade.—It is rumored that the Brooks intend to build a smelter at Beatty, but it is said that this depends upon whether the Brooks gain control of the Tecopa mine.

WHITE PINE COUNTY.

Work is being pushed on the Nevada Northern railroad. The laying of track on the high ore line is being carried on with as many men as can be worked. Steam-shovels are ballasting the tracks from Ely to the Star Pointer mine. This work will be completed about Jan. 1. The force on the Veteran grade is to be increased to 100 men in the next few

days. At the smelter at McGill 700 men are working. No skilled workmen have been laid off at the smelter and only what few foreign laborers as was rendered necessary owing to completion of most of the grading, etc. At the mines in Copper Flat the smaller companies are hiring all the skilled English-speaking miners and even some of the foreigners recently discharged. The first unit of the concentrator at McGill is now under roof. It is hoped that the concentrator will be ready for operation by Jan. 1. The Star Pointer mine is keeping up steam but nothing but absolutely necessary work is being done. At all the Nevada Consolidated properties this same policy is being adhered to, until the smelter is ready for operation, for all preliminary work has been done and sufficient ore to run the smelter for several years is blocked out in the mines. All the good miners, who were laid off by the Nevada Consolidated Co. last week, have gone to work at other mines in the camp.

BRITISH COLUMBIA.

BOUNDARY DISTRICT.

Two furnaces out of the battery of three are still operating at the British Columbia Co.'s smelter at Greenwood.—The electric machinery at the Crescent mine was tested last week. The mine is equipped with a 6-drill electric air-compressor, an electric hoist, and an electric fan.—The representative of F. Augustus Heinze has failed to take up the bond on the McKinley group in Franklin camp.—Steam is being kept up in one boiler at the Brooklyn mine so as to run the pumps until the final decision of the directors of the Dominion Copper Co. is made; no further word has been received from the company officials as yet.

The shipments to the smelter were as follows last week: Boundary, 33,989; Rossland, 6,938; East of Columbia river, 5,910; total, 46,867 tons.—Owing to the cutting down of the output at the Montana smelters, the shut-down of the Dominion Copper Co. smelter in the Boundary district, and the increase in the number of the men employed in the colliery and at the coke ovens in the Crow's Nest Pass, coke is coming to the smelters in good quantities and there seems little danger of a fuel famine at the smelters this winter.

On account of orders received from the head officials of the Dominion Copper Co., W. C. Thomas, the general manager, closed down the smelter at the Boundary Falls last week. This is due to the drop in the price of copper. Mr. Rundberg, the superintendent at the mine, has laid off the men employed at the Rawhide and Sunset mines; those at the Mountain Rose, Brooklyn, and Idaho had been laid off three weeks before when two of the furnaces at the smelter were blown out so as to make them into one large smelter. About 350 men have been thrown out of employment by the shut-down of the mines and smelters. During the shut-down considerable remodeling and new work will be done at the smelter.—Work has started on the foundations for the compressor, which is to be installed at the Mother Lode mine belonging to the British Columbia Copper Co. It will have a capacity of 3,400 cu. ft. per min. and will be operated by a 600-hp. electric motor.—Last week two shifts were put on at the Victoria shaft of the Granby mine and the hoist at No. 2 shaft, which has done heavy service for 10 years, is in the future to be used merely for lowering powder, tools, etc. The shaft-house at No. 1 shaft is being torn down as a needless source of danger from fire.—No ore was shipped from the Athelstan mine last week.—Diamond-drilling has begun at the Skylark mine, three miles from Phoenix.—The decrease in the ore shipments last week was due in a large part to the inability of the railroad to haul the ore during the first part of the week.

ROSSLAND DISTRICT.

Last week the ore shipments from the Rossland mines were as follows: Centre Star shipped 3,710 tons; Le Roi, 1,995; Le Roi No. 2, 560; White Bear, 140.—The shaft at the Idaho is now down 215 ft. Good ore has been found on the 400-ft. level in workings from the Centre Star mine; the Idaho is also opened up from the 1,100-ft. level of the Centre Star. The Iron Mask, the War Eagle, and the Centre Star are all looking well and the new development

work is constantly increasing the ore reserves.—Development work on the 1,500 and 1,600-ft. levels of the Le Roi is progressing rapidly and with good results. Diamond drilling is still being done at the Spitzee mine, but with what results is not announced. The tonnage at the Le Roi is not as large as formerly owing to the closer sorting with of course a higher grade of ore shipped.—The Le Roi No. 2 is looking well; there are no new developments at this mine.—The mill at the White Bear is running and concentrates will soon be shipped to the smelter.—The saw-mill at the Inland Empire mine has saved a good deal of timber for the buildings to be erected at the mine. As soon as the buildings are erected, development at depth will be pushed ahead rapidly.

SLOCAN DISTRICT.

The Old Gold group up the Duncan river is looking well. Considerable development work has been done at this mine this summer.—At the Krao shaft-sinking has been stopped owing to the large flow of water struck in the shaft. The pumps are running full capacity but are with difficulty keeping the water below the 200-ft. level.—During September the Montezuma mine shipped five cars of

magnetic zinc separators is being installed. The old tailing is being run over tables, with satisfactory results.—The Montezuma Lead Co. is shipping some ore, but the mill has not been started.—The mill of the Granadena Mining Co. is treating about 100 tons per day. Sewell Truax is the manager.

Although there was some friction at the annual meeting of the Greene Gold-Silver Co. at New York, still no receiver was appointed as has been reported. Work on the new mill at the Navidad mine belonging to this company is being hurried so as to have the mill completed by Jan. 1. At present, with a mill capacity of 175 tons per day, the company produces about \$60,000 per month; the new mill will increase the mill capacity to 500 tons per day.—Rich ore is reported to have been found on the 400-ft. level of the Los Bronces mine belonging to the Chihuahua Copper M. Co. at Santa Barbara. The new duplicate gas-electric generator plant for the Justicia y Anexas mines, belonging to the same company, has arrived; it consists of two 60-hp. units, with air-compressors and drills.—The Tecolotes mill at Santa Barbara is treating 500 tons per day.—The Granadena mill is running again, as it was possible to repair the broken crusher at the Parral machine-shop.—Considerable machinery (boilers, pumps, etc.), is being moved from the Refugio mine to the Palmilla mine by the Coram company, which recently bought the Palmilla.—The unwatering of the old Casados mine in the Hostolipacillo district of Jalisco, has just been completed, and considerable rich ore has been found in the old workings.—The law-suit in regard to the title of the Homestake mine, about 20 km. west of Rancho Barrancas, has been decided in favor of the El Paso owners.

DURANGO.

The Penoles M. Co., whose mine is at Ojuela, is mining 500 tons per day. The capacity of its smelter at Mapimi is being increased from 1,500 to 2,000 tons per day. The old furnaces are being torn out and modern 300-ton lead blast-furnaces are being put in. The company does considerable custom smelting; siliceous ores from Pachuca are mixed with ores from its own mines, but the company ships its low-grade sulphide ore to the Torreon smelter for treatment.

JALISCO.

Engineers of the Greene Gold-Silver Co. report that three good shoots of ore have been developed in the Matulera mine at Ocampo. The ore carries gold and silver. The mine is developed by tunnels, the lower one coming out at El Salto mill, which has 20 stamps and two Bryan mills, and is run by water-power. This lower tunnel is in 700 ft. and has 600 ft. more to go. W. E. Pomeroy is the superintendent.—A. Fred Pratt is now in charge of the Consolidated Metals Co.'s ore-buying agency at Ameca. This agency was founded last year, and is a branch of the U. S. S. R. & M. Company.

SONORA.

It is the intention to shut-down the Greene-Cananea property completely. This will throw 2,500 men out of employment. By Nov. 10 all the furnaces, concentrating mills, and mines belonging to this company will be shut-down except for a few men at the mine who will be kept to do some important development work. At present there are about 2,800 men employed by the company. A good many of the Mexicans will be given work on the Randolph lines, which are building in northern Sonora. Most of the American miners are leaving for camps in the United States.

The La Piamonte group of 64 pertenencias, about three-quarters of a mile north of the Greene smelter, has been bought from Frisco Arnaldo by the Calumet & Sonora Co.—A fairly rich vein, three feet wide, carrying gold, silver, and lead, has been discovered at the Hole mine, two miles southeast of Ojo de Agua. There are two shafts on the property, one 40, the other 90 ft. deep; the ore was found in the 40-ft. shaft.—The Las Chispas mine at Arizpe is troubled with a shortage of freighters. Work on the Carmen and Grindetta claims is developing some good ore. The September output of this mine was 50 tons of concentrate and 60 tons of shipping ore.



Map of Part of British Columbia.

concentrates. Considerable ore is reported to be blocked out in the mine.—The Province mine, adjoining the Montezuma and under the same management, is being developed and put in shape for shipping ore this winter. John P. Miller is manager of these properties.—The property of the Payne Mines, Ltd., has been recently inspected by the company's consulting engineer. He reported that the mill and machinery are in good shape and stated that he thought that after some more development work the mine would be producing again.

MEXICO.

CHIHUAHUA.

The new 500-ton plant of the Minas Tecolotes y Anexas at Santa Barbara treated 14,000 tons of ore last month. The old dumping ground is full, and the tailing has to be carried across the Mexican Central tracks. There are about 1,000 men on the payroll. A. B. Emery is the manager.—The grading is nearly completed on the Clarinas spur of the Hinds Con. M. Co., and the new locomotive for steep grades has arrived. The machinery for the new mill is stored at Santa Barbara. Modern hoisting and pumping machinery is being erected at the mine.—El Rayo M. & D. Co. at Los Azules is turning out 200 tons of concentrate per month. Bert Peterson is the manager.—The mill of the Mina San Diego y Anexas of the Cia. Metallurgica de Torreon is treating about 200 tons per day, and another unit of electro-

Special Correspondence.

Butte, Montana.

Wages Decreased.—Output for October.—Effects Diminished Activity.—Butte Coalition.—Davis-Daly.—Pittsburgh & Montana.—Mining Resumed.—Colusa-Leonard.—The Barnes-King Affair.

On the first of November the wages of miners were reduced from \$4 to \$3.50 per day, in accordance with the contract signed by the miners and the companies eight months ago, by which the men were to receive \$4 per day while copper remained at or above 18c. per pound, and to return to the \$3.50 scale when the price dropped below 18c. and remained below that price for 30 consecutive days. The companies voluntarily maintained the \$4 rate for more than two months after the price of copper dropped below 18c. There was some apprehension that the employees would repudiate their contracts, but the Miners Union declared its intention to abide by the terms of the contract notwithstanding the action of the Western Federation of Miners in declaring such contracts void. By reason of the curtailment of the copper output, only about a fourth of the normal working force was employed at the mines in October, and the production was in the same ratio. The total output was only about 8,376,200 lb. from 106,175 tons of ore. The total tonnage and copper production, credited to the various companies, were as follows:

Companies.	Tons of ore.	Pounds of copper.
Boston & Montana.....	16,275	1,383,375
Anaconda.....	32,550	2,441,250
Butte & Boston.....	4,650	302,250
Washoe.....	3,100	223,200
Parrot.....	3,875	232,500
Trenton.....	3,100	217,000
North Butte.....	10,850	976,500
Coalition.....	15,500	1,317,500
Original.....	12,400	992,000
Miscellaneous.....	3,875	290,625
Total.....	106,175	8,376,200

The production of the Butte Coalition Co. has been further curtailed, and 150 more men were laid off during the past week. The company had been mining about 500 tons of ore per day, but the amount has been reduced below 300 tons. A. C. Carson, general manager of the North Butte and Butte Coalition Co., predicts that copper will be selling at 18c. again before the first of the year. His opinion also is that the mines will be running full capacity again much sooner than was generally expected when the orders for curtailment were made, for with an improvement in the money situation the surplus copper will quickly vanish.—All work has been stopped on the Davis-Daly mines. The company has had considerable funds in several banks that have suspended, though it is not known whether that fact necessitated a suspension of work, the officials claiming that the treasury is in excellent condition. The last work done was in the Colorado mine, from the 1,000-ft. station of which cross-cuts were run north and south, about 100 ft. in each direction. In the north cross-cut a good sized vein was found, but it contains no ore, and the idea is that the ore has been faulted.—The shaft of the Parrot Co. has reached a depth of 2,030 ft. and cross-cutting on the 1,900 and 2,000 has been started.

The Pittsburgh & Montana Co. has resumed operations at its smelter east of the city, and mining also has been resumed. The smelter, which was built as an experimental plant for a new process, has been almost completely remodeled under the direction of Oscar Rohm, general superintendent, and the process now employed is the same as that in use at other smelters of the district.

As originally constructed it was a modification of the Garretson pyritic process, and was to treat ore without roasting or fuel. The smelter was a flat failure and the company sent its ore to the Washoe smelter. However, when the Washoe curtailed its output and refused to buy any more ore, the Pittsmtont mines had to close. Mr. Rohm then remodeled the smelter. It now has a capacity of about 150 tons of ore per day, and when running at full capacity the company will employ 150 men in the mines and smelter. Recently the company opened large bodies of high-grade copper ore on the 800 and 1,200-ft. levels, from which the smelter will be supplied. The mines had been closed for two months.—The Stewart mine, one of the Clark properties, has been shut down for a week, the shut-down having been made necessary by the fact that the west shaft was to be equipped with a steel dumping arrangement. Operations will be resumed again in a few days.—Copper ore in commercial quantities has been opened at the 600 and 800-ft. levels of the Colusa-Leonard Extension. The vein on the 600 averages nearly 11% copper, and that on the 800 runs about 3%. The ore also carries some silver. Five distinct veins have been encountered in the Colusa-Leonard shaft and cross-cuts. A drift is now being run along the vein on the 600, and a cross-cut is being driven from the other side of the shaft also. A cross-cut south from the shaft on the 800 has a 4-ft. vein of sulphide ore, much of which is mill-stuff. Eastern stockholders visited the property during the past week.

E. W. King, Speaker of the Montana House of Representatives, one of the men who unloaded the Barnes-King mine on the promoters, who sold then to the Barnes-King Development Co., has spoken and has shed some light on the deal. He contradicts the statement of the promoters that they paid \$1,200,000, and says the owners received just \$960,000 net for the property. The sum stated in the transaction was \$1,200,000, that being the capital stock of the old company, but the owners credited back to the promoters of the deal 20% of the \$1,200,000. The promoters therefore received a commission of \$240,000 from the original owners, in addition to the rake-off they took from the new company, voting themselves \$400,000 more out of the money subscribed by the stockholders of the new company. King says he still believes that the property will pay good interest on \$1,000,000. He says he so believed when he sold the mines, but that he never approved of the capitalization of the new company at \$2,000,000, and never saw any report of any person that would justify such capitalization. He declares that the promoters had full and free access to all the books and papers in any way concerning the mine, and that nothing was misrepresented to them or concealed from them, which, if true, only places the promoters in a worse light than ever. King asserts that the mines yielded good dividends on \$1,200,000 for several years and was a paying property at the time of the transfer. He thought a year's ore supply was blocked out at that time, but it is impossible for any one to say that the mine is played out or that it will be a paying property for any great period. It is a limestone formation, apt to run out at any time. King frankly says that it was because of the likelihood of the mine petering out that he was willing to sell. The recent diamond-drill explorations by the new company have disclosed one new orebody, but the ore runs but little more than \$2 per ton and would not pay to mine. Last month it cost the company \$26,000 to produce \$18,000. The new officers have not yet been able to get satisfactory reports from the former officers or from the trustees who held the money subscribed at the promotion. It is likely that suit will be brought against these trustees to recover at

least the \$100,000, which it is alleged was unlawfully diverted from the company's funds.

Toronto, Canada.

Local Taxation.—Concentration at Cobalt.—Mining Developments.—Some Rich Ore.—The Nipissing.—Shipments of Ore.—Violation of the Mining Law.

An important question as to the liability of mines to local taxation on income has been decided by the Ontario Railway & Municipal Board. The Coniagas and Buffalo mining companies were each assessed on \$100,000 as income by the town of Cobalt. They appealed on the ground that no tax should be levied on income until the amount of the capital expenditure had been realized. The Board sustained the assessment and dismissed the appeal.

The erection of several concentrating plants at Cobalt

main shaft is down 150 ft. and altogether 1,500 ft. of driving has been done. A small smelter with a capacity of 400 lb. daily is now in working order and will treat the richer ores which are free from cobalt and arsenic.

—At the Cobalt Contact the main shaft is down 112 ft. and the new shaft 50 ft. The vein on which the main shaft is sunk widened at 40-ft. depth to nearly 12 in. and has been yielding first-class ore.—A plant including an 8-drill compressor and two 7-hp. boilers, dynamos, etc., has been ordered.—At the Right of Way a first-class plant has been installed, consisting of two 100-hp. boilers, a 10-drill compressor, and double-drum 35-hp. hoist. Fifty men will be employed during the winter. A new shaft has been sunk 70 ft. from the vein and is down 85 ft., at which level a cross-cut has been started to tap the vein. At the old shaft, which was put down on the vein, an adit was run for 130 ft. and ore valued at \$120,000 taken out by hand.—The McKinley-Darragh has taken

two carloads of ore from the bottom of Cobalt Lake inside the coffer-dam.—Operations were recently resumed at the Badger by a force of 35 men in charge of A. A. Smith, superintendent. A new shaft is being put down to work the new vein which has been stripped for a considerable distance.—Some rich ore has been extracted from vein No. 54 on the Nipissing, including several large slabs of native silver about an inch thick, one of them nearly two feet long. The yield of the Kendall vein since its discovery last May has been at the rate of about \$100,000 per month. A considerable amount of ore-stealing has been done by employees lately, and this week on a search of the bunks being made one man was arrested, a large silver slab being found in his bunk.

—A good find has been made at the Calverley-Wettlauffer, where a calcite stringer struck at 73 ft. developed a few feet further down into a rich silver-cobalt vein of 1½ inches.—Ore shipments from Cobalt for the week ending October 26 were 217 tons, from the following mines: Buffalo, 30 tons; La Rose, 154; Tretheway, 32 tons.



is expected greatly to increase the output of the camp, owing to the great accumulations on the dumps of low-grade ore, estimated at about 750,000 tons. Concentrators have been erected and are either in active operation or nearly ready at the McKinley-Darragh, Coniagas, Buffalo, and Cobalt Central properties, in addition to which there are three independent concentrators to be operated. One of these, the Muggley, has contracts for ore from the O'Brien, Townsite, Silver Queen, and Nancy Helen. The Cobalt Concentrators, Ltd., will have two plants, one on the Nipissing property and the other on the Foster. The former will treat 100 tons per day from the Nipissing mine alone. The machinery for the Nipissing concentrator is now on the ground, but installation was delayed owing to change in plans. As the result of a dry process in crushing, roasting, and smelting a proportion of the concentrate will consist of pure metallics, and the remainder will contain the ore ingredients of silver, cobalt, arsenic, and nickel, which will be sent to the smelters for further treatment.

At the Silver Queen 52 men and five drills are at work. Some 300 ft. of driving has been done on vein No. 2, having an average width of 7 in. and an average yield of 4,400 oz. silver per ton, besides carrying niccolite. The

The Black Eagle gold mine, in the Lake of the Woods district of northwestern Ontario, has been bought by an English syndicate for \$100,000, and development on a large scale will be started next spring. The shareholders of the Larder Lake Proprietary Gold Fields, Ltd., at a meeting in Toronto on Oct. 30, authorized the issue of debentures to the amount of \$100,000 at 80c. on the dollar to meet expenses. The stamp-mill is now installed and will shortly be running. Several other companies have applied to have their ore run through it for testing purposes, and the result will largely determine the future of the camp. The charge laid by the *Canadian Mining Journal* against Law & Co., mining brokers, of Toronto, of violating the mining law by issuing prospectuses of the Highland Mary Co. without giving the information required by the act for the protection of investors, came up before a police magistrate this week. T. H. Lennox, counsel for the defence, objected to the form of the information as not sufficiently specific and including too many charges. W. H. Price, Crown prosecutor, stated that they were prepared to show that the provisions of the law in regard to prospectuses and the sale of stock had been violated in every particular. The magistrate adjourned the case for a week to allow the prosecution to amend the

information. Law & Co. have brought an action for libel against the *Canadian Mining Journal*, claiming \$50,000 damages.

Salt Lake, Utah.

Dividends.—Progress at Tintic.—High-Grade Ore in the Mammoth.—Better News From Bingham.—The Yampa Smelter.—Boston Consolidated.—Shipments From Park City.—The Labor Situation.

Utah mines paid dividends during the month of October to the amount of \$955,457, the contributors and amounts being: Beck Tunnel, \$20,000; Columbus, \$56,707; Colorado, \$60,000; Grand Central, \$12,500; Horn Silver, \$20,000; May Day, \$12,000; Mammoth, \$20,000; Silver King, \$187,500; Utah, \$3,000; Uncle Sam, \$15,000; United States, \$428,750. Although the latter draws from resources outside of Utah, its principal revenue comes from the operation of its mines and smelters in the Salt Lake valley, and for that reason it is included here.

It has been learned from a reliable source that the American Mines Syndicate has cut into a nice body of ore in running a cross-cut from the Little Chief shaft to the Granite claim, upon which the syndicate holds a bond and lease. To reach the Granite claim, it has been necessary to drive the cross-cut through the Eagle & Blue Bell ground and it is in the latter that the strike has been made. The find is considered to be an important one, as it is in a portion of the Blue Bell far remote from where the company has been working.—The McKinley Co., in the Tintic district, has been installing some new equipment and is now ready to push the development of the mine. The Mammoth Mining Co. has been marketing some high-grade gold ore from its Tintic property. During the past week 30 tons were marketed which averaged close to 100 oz., while another lot of 50 tons averaged 14 oz. The Mammoth mine has the deepest shaft in the State at the present time, namely, a little over 2,200 ft. The Grand Central is down 2,100 ft. and is about to sink to the 2,500. In both mines the ore appears to persist in depth.

At Bingham, the Utah Consolidated continues to operate with a full force and there is no evidence of slowing down because of the low market for copper. This company, it is claimed, is more than paying operating expenses out of its by-products, leaving the copper as net gain. The Yampa Smelting Co. is going ahead with the repairs and enlargement of its Bingham smelter preparatory to resuming operations whenever the market conditions improve. At the mine, electric-power equipment is being installed and a small force of men is engaged in re-timbering wherever necessary. The aerial tramway is nearing completion. The Ohio Copper Co. is pushing work on its new mill at Lark, near Bingham, and if everything goes well, it will be ready early in the new year. The Ohio is a Heinze proposition; but no one here seems to believe that the operation of the mine will be impaired in the slightest through that gentleman's financial entanglements. The Boston Consolidated is shipping a small amount of ore from its sulphide mine at Bingham, but the company is not doing anything else. The construction work, which has been in progress at the new Garfield concentrating mill for nearly a year, has been halted, notwithstanding that the management could complete the plant within a few weeks. The Boston was among the first Bingham mines to curtail its output and cut down its force.—The New England Gold & Copper Co., operating at Bingham, is going ahead with development and production and conditions at this mine are about normal.

The Daly Judge Mining Co., at Park City, is installing its new electric haulage system, which will be ready for

operation in January. In the meantime ore shipments have been cut down 50%. The Silver King Coalition has been asked to curtail its production about 30% by the smelting companies, owing to a temporary congestion of lead ores at the smelters. This led to the rumor that the mine would be closed, but any action toward that end has been officially denied. Ore shipments last week came from two properties, the Silver King and Daly Judge. The former sent out 736 tons and the latter, 392 tons. The Daly West has a small force of men timbering and doing repair work in the mine; but no effort is being made to produce ore and no shipment has been made since the Park City miners' union called a strike.

It is not unlikely that there will soon be a readjustment of the wage scale in force in the several Utah mining camps. Practically all of the copper companies granted a voluntary raise of 50 cents to miners to be paid while copper sold above 18c. per lb. While none of the operators have notified their employees that there would be a return to the former scale it is probable that they will do so, unless the metal market improves in the meantime.—The new equipment at the mill of the New Stockton Mining Co. is completed. The plant will be started on two shifts during the coming week. It will handle about 150 tons per day.—An important strike of copper ore has been reported from the South Columbus mine at Alta. It is of shipping grade and appears to be in a deposit of large proportions.

Cripple Creek, Colorado.

Successful Lessees.—The Trilby Mines.—The War Eagles.—The Christmas Improving.—Annual Report of the Pharmacist.—Accidental Discovery in the Henry Adney.

The Trilby Mines Co. shows the effect of lower treatment charges by evidence of renewed activity; ore produced on company account has been leaving by regular shipments, returns from some of which have been better than 2½ oz., the average for the bulk of ore is between \$25 and \$30 per ton. Van Tilborg has resumed operations, being able, under the new rates, to ship ounce ore, on an average two cars per week. Construction of the \$10,000 cyanide mill on the property is progressing; it is expected to be in operation by February.—Work has been resumed at the Gold Sovereign; this property was handling a large tonnage at the time it closed down several months ago. On the lower levels of the mine the company has a large amount of low-grade ore blocked out; this is being held awaiting the completion of the Golden Cycle mill. Three sets of lessees are working through the main shaft, while Williams & Co. are operating through No. 3 shaft at a depth of 400 ft., shipping two carloads per week of \$30 ore.

The Pinto-Bison and the War Eagles claims, under lease to J. O. A. Carper, are profitable low-grade propositions; at a depth of 300 ft. in the War Eagles, an orebody has been followed north of the shaft, from which shipments at the rate of six to seven carloads per month are made, this record having been kept up for months past. The vein is 3 to 4 ft. wide. On the Pinto-Bison a shoot 3 ft. wide has produced \$20 to \$30 ore for several months; occasional rich stringers have not been followed, as the desire of the lessees has been to prove up the main orebodies.—Becker & Travell, operating leases on the Christmas and Dante properties, are meeting with unusual success; on the Dante a 4-oz. shipment was made; the screenings have averaged \$40, and the coarse rock \$25, on almost daily shipments for the past month. The Christmas has shown good improvement; the lessees are sinking on ore, and regular shipments are being sent out from the Cole & George sub-lease, as well.

The annual report of the Pharmacist is out and shows encouraging conditions. The entire property is under lease to the Pharmacist Leasing Co., which has held it for the past year, an extension of lease having been granted until Oct. 12, 1909. The leasing company has completed over 1,300 ft. of development work in sinking, driving, and cross-cutting, at an expenditure of \$20,000, mostly for the purpose of proving up veins and dikes known to be productive of good ore on adjoining properties, such as the Emma quartz vein of the Isabella Co. and the Wrockloff and Pinnacle dikes. Extensions of veins from the South Burns and Shurtloff claims have been cut near the east and south lines. Several sub-lessees are carrying on extensive development work. It is expected that the property will become one of the steady shippers during the next year. W. J. Hill & Co., sub-leasing on the south end of the property through the Wrockloff shaft, last week received returns from a 17-ton car of $4\frac{1}{2}$ oz.; two other shipments assayed around one ounce.—The Cresson company sent 15 sacks of high-grade ore to a local sampler; this is expected to return \$1 per pound, the total weight approximating 1,500 lb. The property is now operated entirely on company account, the holdings of the Union Leasing Co. having been recently taken over.

The Henry Adney, one of the best producers in the camp, and the scene of many rich strikes in the past few months, has another strike of great promise, not the least interesting part of it being the fact of discovery by accident. A cave occurring on the 550-ft. level exposed ore that gave returns of better than 4 oz.; the ore-shoot now being broken is more than five feet across.

Goldfield, Nevada.

Effect of Financial Conditions.—Smelters Slow in Payments.—New Railroad.—The Rawhide District.—Output of Goldfield Mines.—Recent Dividends.—General Conditions.

The financial distress of the last few weeks has been keenly felt in Goldfield and as a consequence, operations on several leases have been temporarily stopped. The output on others has been curtailed, owing to the attitude of the smelters, which insist on 90 days leeway in settlement of ore purchased. Little Florence is not shipping while the present smelter situation exists, but is piling up \$300 ore on the dump at the rate of about 60 tons per day. The Goldfield Consolidated has not shipped to the smelters for several days, but is treating over 60 tons per day at the Combination and Kinkead mills. Mr. Kirby, superintendent of the Combination mill, made an examination of the Olinghouse mill at Wadsworth, with a view to shipping part of the Consolidated ore there for treatment, but his report was unfavorable. The cost of putting the mill in shape would be approximately \$15,000 and require three months, which made the plan impracticable. The Las Vegas & Tonopah railroad, which has just been completed into Goldfield, will soon accept ore shipments, and it is reported at a lower rate than was formerly paid. These shipments will go directly to the smelters at Salt Lake City.

The machinery for the Florence mill was shipped from Denver nearly two months ago and is expected soon. The building is practically finished and but a short time will be required to put it in condition for work.—Samples of ore from Rawhide have recently been received by local assayers, and have showed gold up to \$10,000 per ton. A town is fast springing up and it is reported that 85 leases are in operation. Several Goldfield miners and business men, who have lately returned from that district, are enthusiastic over the surface showings and predict one of the best camps in the State.

Rawhide is near the boundary line of Esmeralda and Nye counties, and it is not yet determined in which county it lies. Owing to the closing of several of the Goldfield properties, many of the idle miners are going to the new camp.

The output of Goldfield mines for the week ending November 3 was:

	Tons.	Value.
Mohawk	834	\$125,000
Mohawk-Combination	768	53,700
Begole lease	390	29,000
Rogers syndicate	90	9,000
Florence	46	4,600
Combination mill	560	39,200
Kinkead mill	140	7,000
By railroad—		
Mohawk	698	100,000
Begole lease	165	16,500
Total	3,741	\$399,700

The smelters have made a rule requiring 45 days in settlement for ores purchased. As it takes about 30 days



Map of the New Mining Districts of Nevada and California.

for ore to reach the smelters after shipment from the local samplers, the latter have to wait from 70 to 90 days to get their money from the smelting companies. The ore-purchasing companies cannot pay for the ore in advance of their own settlement with the smelters because the banks are not now in a position to afford the usual facilities. This has upset the ore market, and has compelled the samplers, who act as middlemen, to decline the purchase of ores except those running above \$60 per ton, as the smelters are only willing to take such material, finding it necessary to cut down on the quantity of lower-grade ore heretofore received. It is stated that the Western smelters can handle weekly about 3,000 tons of the silicious ores produced by this district and until the larger mines get their own mills in operation, the realization of profits is likely to be hindered. The Consolidated Co. has 139 cars in transit between Goldfield and the sampler at Millers. While the men in the stopes have been laid off, the Mohawk shaft is still being sunk and the winze below the 450-ft. level is being continued. During the month of October this district distributed \$661,000 in dividends, of which \$350,000 was paid by the Goldfield Consoli-

dated, \$120,000 by the Mohawk Jumbo, \$100,000 by the Little Florence, and \$91,000 by the Frances Mohawk. The Consolidated has announced monthly dividends, but it is possible that the payment of them may be hindered by the difficulty in getting settlement for the ore produced. In the meanwhile, the lower-grade ore is being treated at the Combination and Kinthead mills. The closing down of a large number of wild-cats has tended to improve the labor market and to lessen the likelihood of strikes among the workmen.

[Note.—The position of the smelting companies is not as unreasonable as it is made to appear by some of the mine-owners. At the present time it takes from 60 to 90 days to get base bullion from the local smelter to the Eastern refinery, this delay being due to congestion of traffic and lack of cars on the railroads. The Selby smelter can treat about 700 tons per month of silicious ore. At the present time it is glutted with such material, having received 2,000 tons from Goldfield alone in 22 days. This ore averaged three ounces of gold per ton and is what is called 'low-grade' ore at Goldfield. Lately, the rule has been made to receive only ore richer than $3\frac{1}{2}$ oz., there being a better margin on the richer ore than on the poorer. It may also be noted that the Selby smelter is hampered by inability to roast the sulphide ore which would otherwise be mixed with the Nevada silicious output. Owing to the trouble made by the farmers of Solano county, it has been deemed advisable to divert most of the sulphide ore to Everett and Tacoma. We understand that the Salt Lake smelters are loaded up with silicious material, and that from 200 to 300 tons per day is sent to Denver from Nevada.—Editor.]

Denver, Colorado.

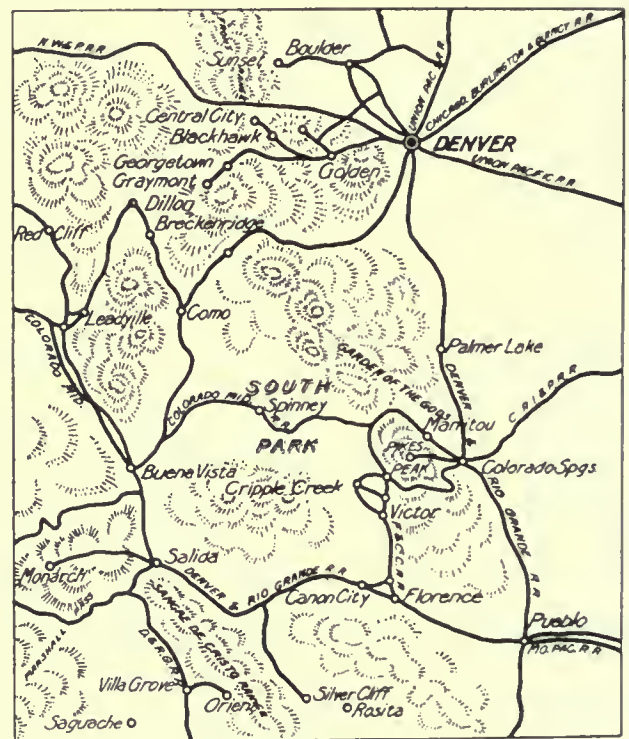
Stimulus to Gold Mining.—The Coal Strike at Colorado Springs.—An Adjustment Likely.—The Golden Cycle Mill.—Experimental Work.

Since the unprecedented drop in the price of copper the attention of mining men and promoters has been directed toward gold mining. Operations at Cripple Creek are showing the result to a marked degree. Increased activity is reported at almost every mine. The reduced transportation and treatment charges, coupled with the influx of experienced miners, indicate an increased tonnage from this famous camp. Several of the mines closed down when the Golden Cycle mill was burned, and have been waiting for that mill to be rebuilt. These mines are now taking advantage of the reduced rates and resuming mining operations. The Trilby Mining Co. has its new cyanide mill and roaster well under construction. The directors of the Colorado Zinc & Chemical Co. held a meeting at Denver on October 25, and decided to suspend operations and close up the affairs of the company. For the past two years the company has been trying to develop a new process for separating zinc ores in its plant at Utah Junction, just outside of Denver. They have failed to make their process a commercial success. At the annual meeting of the stockholders of the Colorado Fuel & Iron Co., held at Denver, Oct. 22, Z. M. Bowers, of Cleveland, Ohio, was elected to succeed R. C. Clowry, of New York, who resigned as a director of the company.

The local coal strike at Colorado Springs, which has been worrying everybody concerned for the past week, seems to be nearing a settlement. Alex. Swanson, Deputy State Labor Commissioner, accompanied by George A. Hally, president of the State Federation of Labor, spent Friday at Colorado Springs investigating the causes that precipitated the strike. Although their presence did not materially affect the attitude of the

strikers and operators, yet it served to bring the questions at issue clearly before the public. The miners demand check-weighmen at the mines, an eight-hour day, an increase in the rate of wages paid to pick-men and machine-men, and the recognition of the union. This last demand for recognition seems to be the real point at issue. The operators do not feel that they can agree to this as it would mean the discharge of the men who have stuck by them during the present strike. There was some complaint that the striking miners had not been paid in full. This is now understood to be merely a business formality. The striking miners have been given ten days' notice to leave the company houses and the balance on their wages is simply held to cover the rent. Thus far the strike has been without violence and the local authorities expect no trouble. The Patterson mine and the mine of the Monument Valley Coal Co. are working under union conditions. As both sides seem willing to look at the matter sensibly, it will doubtless be adjusted in the near future.

The debris of the Golden Cycle mill is being removed rapidly. About 225 men are employed in the work of clearing the ground to make room for new buildings.



A Part of Colorado.

The roaster building is being constructed of iron and steel and will be as near fire-proof as it is possible to make it. This building, it is estimated, will be completed in about 10 days and the roasters installed. Four new duplex Edwards furnaces of 100 tons capacity each will take the place of the old furnaces, which were erected a number of years ago. About 900 tons of scrap iron has been disposed of to the Colorado Fuel & Iron Co. and 200 tons to a local concern in Colorado Springs. These figures give an idea how much material has been handled since the fire, which occurred on August 7. This does not include the number of tons of charred wood and ore that had to be handled. Besides the 225 men, 60 to 75 teams are employed in hauling sand, gravel, etc., as well as excavating for the buildings. Should good weather prevail until Christmas, the management expects to be operating a portion, if not all, of their furnaces. The cyanide plant, which was not destroyed by the fire, is at present handling the old tailing-dump. Franz Cazin is

designing the plans for the plant and C. W. MacArthur has charge of construction work.— A large amount of experimental work is being done at the Portland mill with the hope of improving the present method.

Johannesburg.

A Regrettable Incident.—Riotous Coolies.—Repatriation.—Kaffir Labor.—The Unemployed and the Tin Mines.—Position of the Boer Government.

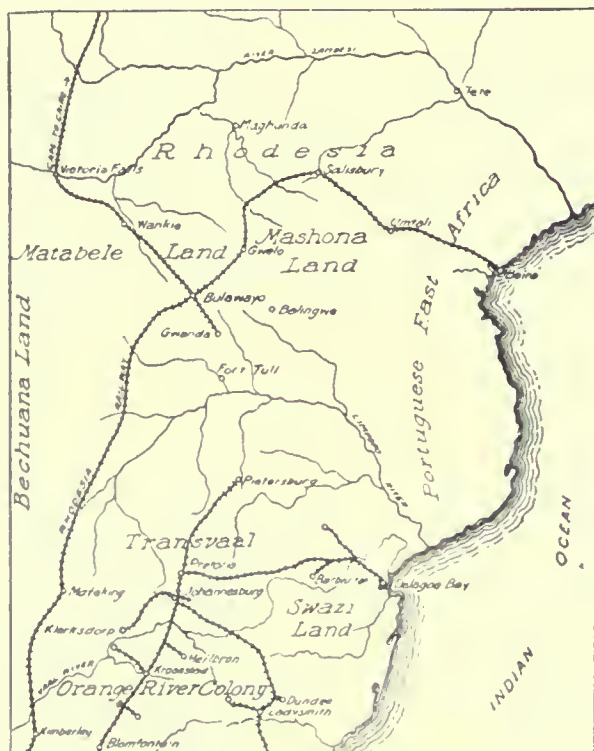
A rather serious affair occurred at the Wit Deep mine last week, among the Chinese. Quite a number of the coolies had finished their three years' service and were expecting to leave for China this week. The management, however, decided to take advantage of a clause in the Importation Ordinance, which states that coolies have

again for three years; in fact, numerous coolies have come to the compound managers and offered them large sums of money for the privilege of remaining on the Rand. This fact gives the lie direct to those irresponsible individuals in England who are so fond of stating that the coolies are down-trodden, practically slaves, and are eager to escape from the slavery of the Rand. Since the coolies have to go, most managers are glad to get rid of them as quickly as possible, after their time is up. For a month or so before their departure, the coolies get very slack, and require a lot of driving to do as much work as formerly.

It is satisfactory to note that as yet there has been no trouble in getting sufficient Kaffirs to replace the departing coolies. The class of Kaffir coming to work just now is excellent. Many of them have worked on mines before. Unfortunately most of the Kaffirs will not sign for more than six months. At the end of that period they will return to their kraals and do nothing for a year or eighteen months. The statement that to replace the 50,000 Chinese now at work will require about 150,000 Kaffirs is not far out, when one remembers the short period of service of the black man. No great trouble is expected with labor this year, but in a year or eighteen months, when the majority of the coolies have departed, and the Kaffirs realize that they have the monopoly of the labor market, then the mines will feel the pinch.

A start has been made in solving the problem of the white unemployed. At the present time there are about 525 white men at work for the municipality of Johannesburg, on road-making and the new drainage scheme for the city. The wage is \$1.21 per day, but wherever practicable the men are put on piece-work. The average earned is not much over \$1.21, but small gangs are making as much as \$2.45 per day. The men have to work very hard for this wage, which at the ordinary prices in Johannesburg means a bare living. But the severe depression is teaching the community that men can be boarded for \$14.50 per month, as against \$30 which is the price generally charged. By some co-operative scheme it is hoped that the small pay received by the white municipal workers, will be made to go as far as possible. All kinds of white men are seen at work on the streets. The majority are young Afrikaners, but a number are men who have seen better days in the Transvaal, speculators, clerks, etc. To these men the work is severe, but it is hoped that in a little while their muscles will be toughened, and that they will be able to earn the maximum pay. As their more fortunate pals pass the workers on the street, on their way to business or the mines, they give them a cheery greeting, and by look and word express their admiration of men who notwithstanding their inexperience of manual labor are determined to toil for their daily bread rather than accept public charity.

A start has been made by the Government with their scheme of working the tin deposits with the white unemployed. Considerable anxiety concerning the feasibility of the scheme is being expressed by men who know. The Government had more direct ways of helping the unemployed. It would have been a simple matter to put the out-of-works on the Premier diamond mine, or on railroad construction. As it is, 25 or 30 men have been sent up to the tin fields. With the best of luck it will take some time to prepare for the hundreds of white men seeking employment. This tin scheme is a case of "heads I win, tails you loose," as far as the Government is concerned. Even if the experiment is a fiasco, and huge sums of money are wasted, the Boers will not suffer, for most of the taxes are paid by the industrial communities. All that will be necessary, if more money is required, will be to squeeze Johannesburg a bit more.



Map of the African Goldfields.

to work out their unlawful absence if required to do so. For instance, if a Chinaman is sent to jail for one year he can be forced to remain on the mine for another twelve months to make up for this period. The coolies objected to working out their time and refused to leave their quarters. The police were called in, and warned the coolies that all who refused to go to work would be arrested. The presence of the police seemed to infuriate the coolies, and seizing what rude weapons they could find, they cried out that they wanted to fight. Bricks, sticks, and stones were hurled at the police, who were at last ordered to fire on the coolies, with light shot. The order was given to fire low. A large number of coolies were brought down on the first volley, but this action of the police cowed the Chinese. The wounded were taken to the mine hospital, where one of them died. The incident was a most regrettable one, and will have a bad impression in China, where the people will say that in South Africa the coolies are shot down after finishing their three years' service.

Some friction is being occasioned over the repatriation of the Chinese, but there is not as much trouble as was expected. Many of the coolies are very averse to leaving the Rand, and declare they should be allowed to exercise the right given them in their original agreement, to sign

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

A Sampler Wanted.

The Editor :

Sir—Where can a spiral sampler for wet sand be obtained? I have made them from round $\frac{3}{4}$ -in. iron, with flat iron, $\frac{1}{8}$ by 2 in. wound about it, spirally, forming a screw 2 in. diam. and 3 ft. long, with the flat iron brazed to the round iron. The lower end was sawed off square and the upper end, with 18 in. of $\frac{3}{4}$ -in. round iron extending beyond the screw, was welded to heavier iron having a handle like a ship's augur. This did good work, but in the hands of careless men the brazing, imperfectly done, became loosened.

Does any dealer in cyanide supplies make such sampling augurs? Let him advertise his wares. Can your readers, including dealers, supply the information?

C. Y. KNIGHT.

[Will Mr. Knight send his address?—Editor.]

A Suggestion to Road Supervisors.

The Editor :

Sir—While making the trip from Ouray to Telluride by way of Sneffels and the Virginus mine a few weeks ago I became thoroughly impressed with the idea that sign-boards should be placed along the trails for the use of strangers who are not familiar with the country, and who are more than likely to take the wrong trail. Before leaving the Revenue mill I made inquiries as to the road to take, and was given to understand by parties who were familiar with the route that it would be impossible for me to go wrong. As luck would have it, I did not go wrong, but more than once I came to the parting of the ways and was undecided which to take, as both were more or less traveled. Fortunately, I took the lower or right-hand trail and came out all right, although below the Virginus instead of on a level with it. At the Virginus I made inquiry as to the route to take to get over to Telluride and was told that the trail was good, as only a few days before parties had gone over with horses and that it would be impossible to miss the way and there was but one gap to get through. After reaching the little mesa above the Virginus I discovered a number of gaps which looked about the same and through which a man and beast could go, but the good trail was missing, it having snowed the day before and filled up the tracks completely. Again fortune smiled on me, and I gained the summit and found I was on the right road, but no signs of a trail on the Ouray side until I had reached the gap. I could then see buildings in the distance to the left, which I took to be the Tomboy mill. On the Telluride side the trail was in good shape and easy to follow and in a short time I was down to some of the workings of the Smuggler Union. Men who are accustomed to making the trip from Telluride to Ouray and other points and who have made it several times cannot fail to realize how a stranger can get off the trail.

In September a couple of years ago I made the trip from Ouray to Lake City by way of Engineer Mtn., and before reaching the summit I found myself lost and in a blinding blizzard. I found a cabin and took possession. It happened to be the residence of some miner or prospector who was away from home at the time. In the cabin I found plenty of food and a place to sleep, so I did not suffer. On top of the continental divide in a snow-

storm, lost, and without matches, with night drawing on, was a serious matter. The next morning the storm had abated and I decided to try my luck on one of the trails. Perhaps a couple of miles down the hill I found a cabin and an old prospector who kindly directed me to the trail leading down past Rose's cabin and to Lake City. "Do you see that saddle in the mountain?" he inquired, and upon assuring him that I did, he replied: "That is where you want to go through to get over on the Lake City side." I explained to him that I had stayed over night within a few rods of that same gap and had just come from there. However, after partaking of his beans, bacon, and coffee, I started out for the 'saddle' in the mountain. After floundering around in the snow and over the bogs for some time, I reached the 'saddle' which I had left a few hours before and proceeded to Rose's cabin, where I procured dinner about 2 p. m. At that time I was of the opinion that trails in the mountains as well as the desert should be supplied with sign-boards pointing the direction to certain places, especially where human habitation is scarce and uncertain. They would save the stranger, and perhaps others, a good deal of anxiety as well as the loss of time in doubling back after he finds he is on the wrong road.

It would seem to me that counties like San Miguel, Ouray, San Juan, and the Hinsdale should see that these signs are provided and kept in repair.

E. MOORE.

Denver, November 2.

Ore Deposition.

The Editor :

Sir—Your valuable remarks on the deposition of ore and the timely observations of Mr. Winchell have established a new high-water mark in the tide of information, which, we all hope, will some day rise high enough to float away all our ignorance concerning this matter. As every little observation of fact helps to increase the sum total of our knowledge, I will mention two phenomena (the Editor says when we don't understand a thing we call it a 'phenomenon') that came under my observation.

In 1904 I examined a number of mines and prospects along the coast of British Columbia, and I noticed the same conditions mentioned by Horace V. Winchell (MINING AND SCIENTIFIC PRESS, July 13). In that very moist climate and in a country that has been lately scored off by glaciers, we find totally different conditions from those prevalent on, for instance, the desert of Arizona. There is little or no iron cap on heavy sulphide veins and consequently little ore of secondary origin except as hereinafter mentioned. The sulphides are found close to the surface. I noticed, however, that, close to the surface, pyrrhotite was generally to be found instead of pyrite. Magnetite of a very hard and dense variety is common, and on Texada island it has been developed to such a great depth (850 ft. if I remember correctly) that it would seem conclusively proved that the magnetite is not in any way related to the recent alteration of the sulphides. It is, of course, entirely possible that the veins have undergone two periods of mineralization, and that the magnetite is an alteration product of an earlier mineralization, which weathered under altogether different conditions to those now existing, or it may be that the magnetite is a primary mineral. The question naturally presents itself, could an oxide such as magnetite, and a sulphide such as pyrite, deposit from one and the same solution? I don't think they could, but am not sufficiently up in my chemistry to speak definitely. One of the properties I examined at this time was a large contact between lime and felsite situated at the north end

of Vancouver Island. There was a narrow band of magnetite in the centre of the mineralized matter, which contained some chalcopyrite. The balance of the huge contact vein was made up of alternating bands of pyrrhotite, altered country rock, and quartz. The pyrrhotite appeared practically at the surface, although there was partial oxidation to a depth of 20 ft. (the deepest hole on the property). Near the limestone edge there was considerable oxidation and some caves had been formed by the eating away of channels in the lime by the acid products of decomposition. All this pyrrhotite ran a trace in copper and a few cents in gold and silver. I had always thought that when the sulphide zone was reached, the copper content was practically settled, that is, that there was no reason to believe that a barren sulphide vein at surface would be anything but a barren sulphide vein at depth. I supposed that (although there had evidently been partial oxidation) what sulphides were left were a fair representation of the sulphides which would be found below. In this I appear to have been wrong, for subsequently three shafts were sunk on the outcrop, and at the depth of 30 to 40 ft., each one of them came into ore running from 1 to $1\frac{1}{2}\%$ copper; also a great deal of water was encountered. It is correct to say that I did not go back and sample these shafts myself, but I have no doubt of the truth of the reports. Now these facts would indicate that in those wet countries a partial oxidation may occur accompanied by a selective action and that copper pyrite yields more readily to oxidizing influences than the sulphides of iron. Of course I do not mean that this is a proved fact, but this particular deposit suggests that something of that sort may occur. In this particular case the slight increase in copper content was immaterial from a commercial standpoint; but one can readily imagine a case where an increase of one or two per cent in copper might be a very important matter. In examining mines in wet countries it might be well to consider the possibility of selective leaching.

About the same time I examined a gold vein in northern California; it was a quartz vein which was remarkably persistent in strike. The quartz had a honeycomb structure showing that in the sulphide zone it carried considerable iron pyrite. It was low-grade, however, except in spots. All the workings were in the oxidized zone. One of the peculiarities of the vein was that the iron oxidized to a gelatinous hydroxide instead of to an oxide. In some places in the vein this rule had not been followed, and there were bunches of vein-matter where the cavities in the quartz contained hematite. There were other bunches where the pyrite was unoxidized. These bunches of hematite ore and of pyrite ore always assayed more than the leached out quartz. In the latter the cavities contained only the dusty brown powder which is characteristic of an ore that has oxidized to hydroxide. The manager was a bright fellow and he maintained very stoutly that the hydroxide leached away and took the gold with it. I laughed frankly at this theory and asked him if he was trying to butt into the class of old prospectors who harp on the theory that all they need is depth, but who really are more eager to explore the depth of the tenderfoot's pocketbook, than they are to go deep on their chums. It is well known that gold veins are generally richer at the surface than anywhere else. This is because gold is the most inert element known to chemistry, so the other minerals leaching away leave more gold to the ton, although probably not more to the cubic yard. The manager maintained his theory so stoutly, however, that it set me to thinking to devise some method of proving or disproving the theory and as I recalled seeing some tiny streams of water, thick with this gelatinous hydroxide, trickling down the breast of

the lower tunnel I suggested that if the gold really was being kidnapped by the hydroxide we could catch the thief in the act. Accordingly we got a lot of coal-oil cans and fashioned some spouts of tin and caught a lot of this brownish water. I then strained it through a cheesecloth and evaporated to dryness and had the residue assayed. It ran \$19 in gold. Now this result figured back on the average loss in weight between the hematite quartz and the honeycomb quartz did not account for the average difference in value between these two classes of ore. It did show, however, that where a vein has oxidized to a hydroxide it is possible that some of the gold may have been carried away from the oxidized ore. I know of no chemical solution of gold that would exist in a fully oxidized solution, so the idea has suggested itself that possibly the gold was mechanically entangled in the gelatinous stuff. Gold, as we know, exists in iron pyrite in some form in which it will not amalgamate and it is supposed to exist as a sulphide. In any case, the decomposition of the pyrite undoubtedly leaves it in a state of extremely fine subdivision, probably in an allotropic form (a bronze-colored powder). In this form one can readily imagine that any gelatinous substance might entangle and convey considerable quantities of it.

GEO. J. BANCROFT.

Denver, October 11.

Professional Customs.

[The questions to which reference is made in these letters will be found in our issues of October 5 and 12.—Editor.]

The Editor:

Sir—As one of the younger generation, though well past the stage of my first examination, I submit the following as constituting my answers to the questions propounded by T. S. in your issue of the 5th inst. As intimated by T. S., his questions are rather ambiguous and must of necessity be answered in a general way. For my own purposes and for those of the "younger generation" generally, I hope that the questions will be answered in your columns by engineers of greater experience than mine.

1. On a protracted examination, of say one month or longer in duration, but with an understood limit, a fee; of comparatively short duration, or where engaging on a piece of work of indefinite duration, a salary basis.

2. In my opinion this would altogether depend upon for whom the work was being done; if for strangers, a contract; if for others, the responsibility of whom I knew well, I would consider a telegram or letter engaging me to be sufficient.

3. Generally speaking, Yes, if only as a retaining fee, but my relation to, standing with, or knowledge of the persons engaging me would determine this.

4. As a general thing, Yes, and quite properly, I think. Personally, I have made it a rule to supply certain working equipment of my own and to charge a net fee or salary for my services, all else to be for account of the parties engaging me.

5. (a) Reasonable tips to servants, Yes; otherwise, No.

(b) Within reasonable limits, Yes.

(c) No.

(d) Down to occasional 'incidentals,' such as possible cab-fares, baggage-transfers, tips, and like expenses.

(e) Properly, Yes, particularly for amounts exceeding say \$2.

(f) Generally speaking, I would say that such expenses would properly be chargeable to one's own account, though mitigating circumstances might decide otherwise.

(g) Weekly or monthly, with complete statement in detail at end of engagement.

6. I consider it the right of the company to demand, and my duty to supply, periodical reports of the progress of the work in hand. I do not make reports of assays, in detail, or make statements of any kind that would, possibly, conflict with my final opinion and report.

7. No, particularly while still engaged by the company for whom I was acting. Afterward, perhaps, Yes, if such action was not detrimental to my late employers. Should the fact that I have reported favorably on a mine forever preclude my dealing legitimately in its shares? I think not.

8. Always provided that one's employers are not in the field to purchase new ground, and not likely to be for some time to come, and that no company time is lost, I would say Yes, unless my contract with the company stipulated otherwise. I would, however, in such an event, advise the company of my action and freely offer to turn over such ground to it if it so desired. Mining is hardly a competitive business.

9. None whatever, on lines stated in the question.

10. (a) For my part, I do not think that one is at all times justified in saying 'Yes' or 'No.' No one can say with all certainty just what development will demonstrate for a mining property. I have seen mines which, on the surface, or in their early stages, were anything but promising properties, and yet which developed into successful mines. On the contrary, I have seen, on the surface, 15 ft. of pay-ore that, within 20 ft. of the outcrop, all but disappeared and never came in, in quantity, again. This is a broad question and must be answered in a broad way. I do not believe that any engineer is justified in saying either 'Yes' or 'No' concerning any property, unless he has sufficient information at hand on which to base an intelligent opinion; prejudice for or against a certain district, brought about by any one or all of a dozen different conditions, or against, perhaps, a certain formation, should not enter into calculations unless all the governing facts are at hand. I have in mind one engineer who, sent to pass on a whole district in a country strange to him, let the personal discomforts to which he was subjected on the trip influence his whole report, to the discredit of the district in question. Again, I know of another engineer, employed by a copper company in the early stages of its development operations, who thought that every dollar spent in the work had been wasted because, strange in his opinion, the ore was found within the confines of a certain formation. Had this man made the first report on the property he would have said 'No,' and yet the mine in question has developed into a very successful proposition. I do not advocate 'hedging,' but neither do I advocate a 'Yes' or a 'No' unless the facts so warrant.

(b) I would say that an engineer would not be justified in attempting the work outlined, to any considerable extent, unless under proper authority from his employers.

The assumption is that a mine about to be investigated is prepared and made ready for examination. When such is not the case, or where the mine is an old one, badly caved and bottoms under water, such work, if performed, should not be charged to one's expense account, by which is meant charges for traveling, living, and other, generally minor, expenses, but as one of the major costs of the examination.

NORVAL J. E. WELSH.

San Antonio, Texas, October 16.

The Editor :

Sir—I have just received your letter with enclosure of 'Searching Questions,' with a request from you that I

answer them. I have carefully read the prelude and questions following. They forcibly suggest to me the necessity of establishing in our technical schools a new chair to teach their students how to avoid graft.

1. It is a good plan to charge a fee to cover all expenses for professional work.

2. It depends upon who your employers are; generally I should say a letter or telegram was sufficient between reputable people.

3. Yes, and I think it a good plan.

4. This question is a bit ambiguous. The employer can only be properly charged with labor and materials actually used in an examination.

5. (a) These expenses are none of them legitimate unless specially agreed to in advance by employer.

(b) In answer to this question I should say that an examining engineer is entitled to first-class accommodations by land and sea.

(c) This savors too much of petty larceny.

(d) Expense accounts should be kept in great detail, no charges made to an employer that cannot be itemized. 'Incidentals' are not permissible.

(e) It is a good plan to take vouchers for expenditures where possible.

(f) Such expenses should certainly not be charged to an employer.

(g) This is a matter for the employer to decide.

6. Preliminary or periodical reports are to be avoided where possible.

7. In answer to the first part of this question, regarding purchase of shares by an examining engineer during the examination, certainly no reputable engineer would resort to such methods. After a report has gone to the directors and shareholders, I should think it permissible. It is, however, a very poor plan for an examining engineer, who desires to make a reputation for himself, to try and make money by speculation in mining shares.

8. In answer to this question I would say it is always easy to communicate with your employer on such subjects before acting on your own account.

9. I cannot see why an employer would object to your publishing your views concerning any district.

10. It is certainly not expected of an engineer to say 'Yes' or 'No' to anything he is in doubt about. He is supposed to represent to the employer just what he sees. Regarding the earlier part of this question, it is often necessary to unwater mines and clear out old drifts, and in such cases it is nearly always possible to communicate with your employer by letter or telegraph. It is always well to learn as much about a property as possible before starting the examination.

RALPH NICHOLS.

Gabriel, Durango, Mexico, October 22.

Questions by a Practical Miner.

The Editor :

Sir—A few days ago on one of my trips through the mountains, I met a miner who had been at work at the old mine Y at Z. Of course, we stopped for a chat, as he always has some questions to the point. This Y mine has some old equipment, but at present there is being installed a large steam plant to generate electricity at a central point and distribute to motors operating the stamp-mill, compressors, hoists, and lights; which is all right, so far as a central power-plant goes. But one day when the superintendent came by, the practical miner asked why they had not put in a hydro-electric plant, as there was plenty of water and head to be obtained within two or three miles of the mine, for power the year round.

The superintendent did not know, as the general manager had bought the plant, et cetera. Also the practical miner wanted to know why the steam plant had three large boilers of some 200-hp. capacity each, two good feed-pumps, also injectors, then one large Corliss engine of some 600-hp. belt-driven generator instead of three engines of 200 hp. each, direct connected to generators. Why should they put all their eggs in one basket? What will you do if your big engine goes lame, or generator burns out? he asked. With your plant in triplicate you could perhaps have ore enough in the stopes and bins so that you could stop the compressors and keep the mill going. Now, if the single plant stops, the whole work stops. Again, the mine is about 35 miles from a railway point. Boilers weigh about nine tons each, the fly-wheel is in two parts, with a total weight of about 16 tons. The engine must weigh as much as a boiler. The first boiler, when hauled in, took 12 horses, three or four men, and three weeks to make the trip. There is plenty of good timber around. The power plant is in a part of California where the average rainfall must be about 60 inches. The lack of sheds to cover the wood will cause some hustling to keep up steam.

Another day the practical miner was helping on some concrete foundations at a new mill. He asked the superintendent if he could not have two helpers on the quartz cropping just above the mill to get out quartz for concrete instead of two men who were down on the river screening and sacking gravel. This was being sacked and hauled up a very steep hill by a four-horse team, one driver and swamper in small loads. The superintendent replied that it was all right as it was. The practical miner said all kinds of tools were short; he had lost enough time each week hunting for a pick or shovel to have paid for a new one. A few days later the practical miner received his time, although the company was needing men badly. The practical miner supposed he had asked too many questions.

W. E. T.

Auburn, September 29.

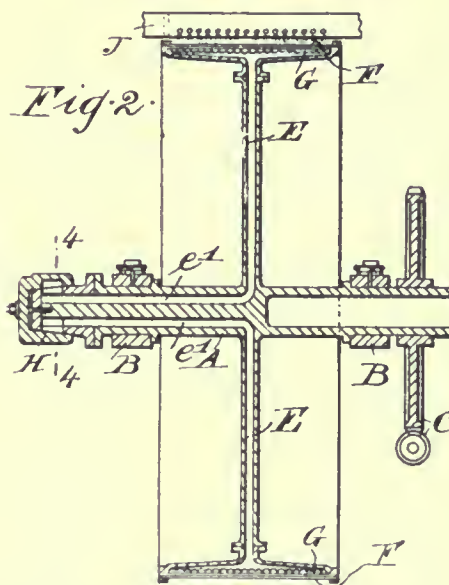
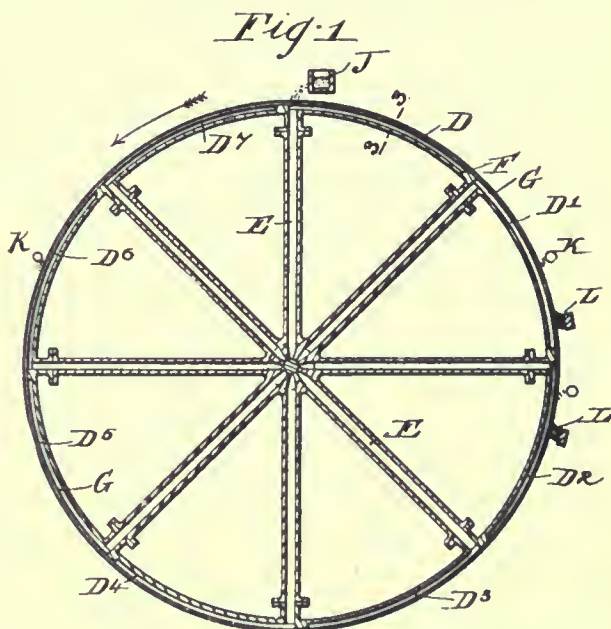
[This is well enough, but the emphasis is in the wrong place. The man who pointed to the mistakes made by the manager was not necessarily a 'practical miner,' he was just a plain man of common sense. In the first place it was not a question of mining; an intelligent mechanic, blacksmith, or assayer could have detected the blunders mentioned. Most 'practical' miners would have failed to do so.—Editor.]

Slime Treatment.

The Editor:

Sir—As a contributor to your valuable paper for some years past, I frequently see letters which, were I closer to hand, would tempt me to put in my oar. In your issue of April 20 just received I notice a letter signed by Edward H. Nutter, which would give the credit of successful slime treatment, and more particularly the idea of cleaning the filters with compressed air to George Moore. Now I claim the originality of this (and I think justly so) to myself. And so that your contributors may judge for themselves, I refer you to attached specification of U. S. Patent No. 619,211 taken out by me in February, 1899. There is an old saying "a prophet is not a prophet in his own land," and such has been my experience. My effort to get the process here described in practical use only succeeded in advertising to others the value of my ideas, and the most that I was able to do was to get a partner in with me who for five years tied my hands; he would not go forward, nor would he go out of it, until about 18 months ago, when I succeeded in inducing him to retire. In the meantime

Moore and several others had got established, and my right (assuming I have rights) would mean litigation. My experience to the present is a loss of over £1,000, experimenting and patenting, the latter alone with renewal fees absorbing £800 or thereabout. This, so far, is my share for solving for the world at large one of the most difficult problems in the metallurgy of gold. For the benefit of inventors generally, I would emphasize the importance of employing a conscientious and capable man to draw up his specifications and would add my opinion is that some patent agents are not interested in pro-



tecting fully the rights of a 'master' patent, I presume for the reason it interferes with business from their point of view.

ASKNI M. NICHOLAS.

Talmahmo, New South Wales, July 5.

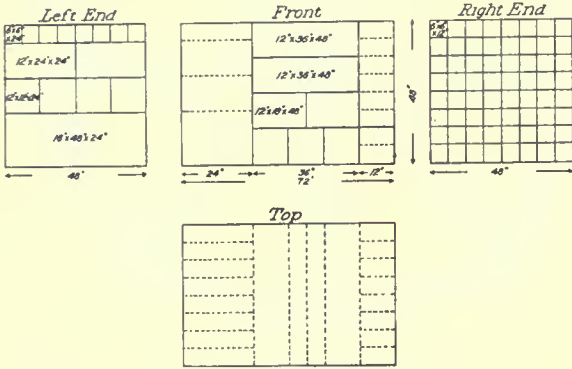
ASBESTOS IN CALIFORNIA.—One of the direct consequences of the earthquake and fire of San Francisco is a greatly increased demand for asbestos on the Pacific coast. Prospecting for asbestos has been stimulated. The large masses of serpentine in the Klamath Mtn. and in portions of the Sierra Nevada, afford promising fields. Several new finds have been reported from California, near the western border of the great belt of serpentine which extends from Plumas county south through Sierra, Nevada, Placer, Amador, and Calaveras counties.

System of Map-Filing.

Written for the MINING AND SCIENTIFIC PRESS
By G. N. PFEIFFER.

A description of the system I have installed at the Santa Franciscan mine may be of interest to some of your readers. Before this was done no one knew just what maps were here, and if he did know a certain map was here the chances were he would have to look for several hours to find it. After examining most of the drawings I devised this method for both the maps now on hand and those to be collected in the future.

The first consideration was a cabinet. The maps are from 6 to 48 in. wide, and from 6 in. to 12 ft. or more in length, so the pigeon-hole had to be used, still as a narrow plat might come under the same heading as a wide plat it would not do to place all in a box long enough for the wide plat. A cabinet as shown in the accompanying sketch was decided on. This really makes three cabinets. The right end has a depth of one foot; the left end two feet; while the centre or front has a depth equal to the width of the end compartments, four feet. The right end is known as A, the centre as B, and the left as C.



A Cabinet for Maps.

Below each box is pasted a small label to show what numbers belong to that box. The dimensions given on the drawing do not allow for thickness of partitions.

The catalogue is divided as follows:

		No. of Map.	Page.
Mining	Surface..	Denounce- { Company's.. 0-100	22-26
		ments .. { Others	27-40
		Topographical	41-42
		General	43-46
	Underground ..	Plans	47-58
		Elevations	59-62
		Miscellaneous	63-68
	Timber	901-950	69-71
	Miscellaneous	951-1000	72-75
	Engines and boilers.....	1001-1100	76-80
Mechanical ...	Pumps	1101-1200	81-83
	Foundations.....	1201-1240	86-87
	Cars	1241-1270	88-89
	Cages	1271-1300	90-91
	Miscellaneous	1301-1500	92-101
Railroad.....	Cross-sections	1501-1550	102-103
	Plans of route	1551-1600	104-106
	Topographical	1601-1625	107
	Switches and frogs	1626-1650	108-109
	Trestles	1651-1675	110
	Miscellaneous	1676-1800	111-116
General	Real estate and leases.....	1801-1850	117-118
	Buildings	1851-1950	119-124
	Electric installation.....	1951-1975	125-126
	Ore-blms	1976-2000	127
	All others	2001-2200	128-137

The numbers of the second column under the heading 'Page,' refer to pages of the catalogue, where a description is given of each plat that comes under that particular division. The numbers in the other column refer to the numbers given to the plats; these are printed in red in the lower right-hand corner on the back; the number on each plat is the same as given with the description in the catalogue. Take for example an 18 by 20 in. blue-print of a one-horse whim. On the back in the lower right-hand corner of the blue-print is the number 2001C (in red), the C shows that this will belong in the left end compartment. In the catalogue on page 128 make this

entry, "2001C (in red). One-Horse Whim; print; 6-3-07." Next cross-index under 'Timbering' and 'Hoists' or 'Engines,' but then give the number 2001C in black. If the description is long, space can be saved when cross-indexing by only giving a key-word and the page where the full description is made. For the catalogue an ordinary surveyor's field-book was used. Most of the maps are rolled and held by a rubber band, the other few are folded. Those that are folded all have the numbers in the same relative position.

The upper part of B is handy for unfinished plats. The lower part of C is for the surveying instruments. The cabinet sets six inches above the floor. It was put together by screws; it is too large for the office-door. Another nice thing is the false top, which can be lifted and used as an extra drawing-board.

COBALT ORE.—The development of Cobalt camp as a silver district has been rapid. In 1905 and 1906 a tremendous amount of prospecting and development work was done, and the value of the ore shipped placed Cobalt in its position as one of the world's rich silver districts. In 1904 there were four shipping mines, the output being 150 tons of ore, valued at \$136,218. In 1905 there were additional mines which shipped ore, the total output amounting to 2,144 tons, valued at \$1,468,524. In 1906 many other properties sent out ore, the shipments totaling 5,129 tons, valued at \$3,900,000. These figures include the cobalt, nickel, and arsenic in the ore, for which in many instances little or nothing was paid to the shipper. In considering the above figures it must be noted that they represent only the ore shipped. The actual production of the camp was greater, as large quantities of ore were stored on several properties. Most of the ore is shipped to smelters near New York. Ore which in any other camp would be considered as high-grade is thrown on the dump at Cobalt on account of the high freight rates to the smelters, making it unprofitable to ship. Thousands of tons of low-grade ore now on the dumps could be shipped a short distance at a profit to the owners. The record of the first six months of 1907 shows shipments of 6,431 tons of ore, valued at \$4,900,000, as against 5,150 tons for the whole of 1906, valued at \$3,900,000.

AFGHANISTAN MINING.—Afghanistan may some day be a great mining district. It is known to have mines of rubies, topaz, lapis lazuli, marble, and other stones; iron, lead, copper, antimony, and other metallic ores; sulphur and several of the earthy alkaline and metallic salts. Coal is also found, and is believed to be extensive near the iron mines. The lead, iron, and precious stones mines are partially worked by the Government with modern machinery, but the mining of the country is mostly carried on by crude processes, and the bulk of the mineral wealth is as yet not touched. According to the few European geologists who have had access to the country, the mineral deposits of various kinds are rich and extensive, and there are to be found both gold and silver in paying quantities. In addition to coal, iron, and other mines, Afghanistan has numerous waterfalls available for power. If the Government would grant railroad and mining concessions to foreigners, the country would develop rapidly, for its mines alone would attract many prospectors, and if found to be as extensive as currently believed, much capital would follow. The Government and people, however, are united in opposing any concessions to foreigners, or even to allowing a white man to take up residence there, as they believe it would eventually result in the white men dominating and controlling the country.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

THE work done by a lessee can be applied to the assessment work due on a claim, and if it is sufficient in amount, that is \$100, no more work need be done for that year.

THE first electric mine locomotive, used in the United States, was built in 1887 and used that year in the Lykens Valley coal mine belonging to the Pennsylvania Railroad. A later one built in 1889 is still in actual service. These were of high clumsy construction little resembling the low, compact, rugged design now prevalent in mine locomotives.

THE main progress in petrography in recent years has resulted from using reflected light in examining opaque substances. Metallographists depend entirely upon reflected light in their research with the microscope. The polishing of ores and the subsequent etching of them with acid prior to examination by reflected light under the microscope has made it possible for petrographers to learn much about the paragenesis of the ore-forming sulphides.

THE occurrence of an area of schist in the Gunnison district is an interesting feature, for, although there are other stretches of these rocks, represented by the actinolite schist of the Arkansas valley and the hornblende schist of the western slope of the Sangre de Cristo, this particular rock is unusual in the mining regions of Colorado, and is not there considered a rock favorable for precious-metal veins, a fact in striking contrast to California, South Dakota, Rhodesia, and other productive regions.

It is often desirable to sample streaks of ore known to be in the foot-wall or the hanging wall of a stope. This can be done by means of drill-holes put into the hanging wall or the foot-wall. The dust is saved and carefully sampled; the depth of the hole drilled and the width of vein represented by the sample are also noted. From these the value of the ore can be easily calculated. This is a cheap way of finding out whether the streak is worth developing; especially is this to be recommended in the case of ore-filled stopes, where the disposal of the waste rock coming from cross-cuts would be difficult.

THE deepest mine in Rhodesia is being worked at a depth of between 1,300 and 1,400 ft. The gold mines of Rhodesia greatly resemble those of California. The Rhodesian veins occur in belts of schists quite similar to the slate belts of California. The veins are narrow being from 3 to 8 ft. in width, generally speaking, and the value of the ore is between \$1 and \$20. Four-dollar ore can be worked at a profit in Rhodesia. The Kafirs are paid about \$15 a month and their food. One white miner is put in charge of 15 to 20 'boys.' Machine drilling is used in mining the wide stopes while hand-drilling is used in the narrow stopes.

THE limit of productiveness in the Smuggler vein at Telluride, Colorado, coincides to a remarkable degree with the base of the rhyolite, where the vein is pinched becoming a mere parting. In the rhyolite the vein is accompanied by a little selvage and some scattered patches of silver ore but nowhere has any cellular quartz, such as is common lower in the vein, been found. In the underlying augite-andesite the bonanza orebodies occur; the richer masses of silver ore are found to follow roughly the harder, almost horizontal, layers of andesite.

Similarly in the underlying breccia, which is fine-grained, the pinches in the vein occur along nearly level lines coinciding with the bedding-planes of the country.

THE loss of power in compressed air transmission at mines is great on account of leakage, and also because of the high friction loss due to the crookedness of the piping. These losses are generally far greater than in the case of electricity, which is especially adapted to transmission through crooked drifts, etc. The one advantage attending the use of compressed air for power is that it aids in ventilating the mine. It is often worth a good deal to a company to be able to open a valve and blow the smoke out of some poorly ventilated stope; by decreasing the length of time that miners are kept idle by this smoke, it often saves considerable money to the company.

MANY difficulties were encountered when electric power transmission was first introduced underground. The air in mines is damp and this moisture condenses on the wires, the insulators, and on the walls of the drifts. All these facts make it easy for much power to leak away. To avoid this leakage insulators have been specially designed which practically prevent leakage of current. Owing to the limited amount of head-room the insulators, hangers, etc., have to be designed to economize this head-room as much as possible. Owing to the moisture condensing on the wires and its reaction with the oxidizing particles of ore and dust which settle on the moist wires, and also on account of warm gases from hot stopes, insulation deteriorates rapidly underground. For that reason a person should consider that all insulated wires underground, which are not armored, are live wires, and act accordingly.

THREE or four years ago when anvil-blocks were introduced into stamp-battery construction they were considered to be a great improvement. They were introduced to help make the mortar-box more solid and also, by distributing the stress on the mortar-block over a larger area, to help lengthen its life. Experiments at the Alaska Treadwell mill in Alaska and at the Geldenhuis Deep in South Africa indicated an increase of about 15% in the crushing capacity due to the introduction of anvil-blocks. It is rather disconcerting therefore to learn that the new 300-stamp mill of the Simmers Deep—the only new mill building on the Rand—will not have anvil-blocks although the stamps are over 150 lb. heavier than any other stamp-heads on the Rand. The mortar-box will rest upon a small rubber cushion placed on the concrete mortar-block. The mill will be run by electricity.

ELECTRIC blasting has many points in its favor. In the first place there is practically no danger of hang-fire (although a few isolated cases have been reported from English coal mines) when electric blasting is used; all holes are fired simultaneously so that the compression waves from one explosion meet those of another, thus reinforcing each other, making the explosion more effective. As there is no fuse to burn, only the gases from the exploding dynamite vitiate the air. As most of the smoke from blasting is caused from the burning fuse and as it is by the amount of smoke in a stope after blasting that miners determine when they will return to work, this last item of less smoke is not to be despised. But electric firing has this one great drawback, the force of the concussion and the shock of the explosion are so great that it can not be used in timbered stopes. Besides it does not pay to fire with electricity if only a few holes are fired at a time. In stopes where there is no timbering and a large number of holes are fired, electric blasting is to be recommended.

A Broad Apex.

One of the vexing questions of the United States mining law relates to the rights of claim-owners in the case of a lode so wide that the whole of its apex is not included within the side lines of a single property. Herewith we print, in its entirety, the decision of the Supreme Court of the United States in the case arising out of litigation at Bingham, in Utah. The decision is dated October 21, 1907, and further comment will be found on the editorial page of this issue.

This suit was commenced in the Circuit Court of the United States for the District of Utah by the United States Mining Company, claiming to be the owner of certain mining property, and praying that its title thereto be quieted and the defendant restrained from taking any ore therefrom. Jurisdiction was founded on diverse citizenship. In an amended complaint, filed June 2, 1902, it was alleged that the plaintiff is the owner and in possession of four mining claims known as the Jordan Extension, the Northern Light, the Grizzly, and the Fairview lode mining claims, the boundaries of each being given; that these mining claims are adjacent to each other and to certain other mining claims, all owned and worked by the plaintiff as one property for mining purposes; that beneath the surface of the claims above mentioned is a vein or lode of great value; that the defendants wrongfully claim to own said vein or lode and the ores and minerals therein contained; that they have by means of secret underground works obtained access thereto, and have mined, extracted and removed large quantities of valuable ores therefrom; that they threaten to continue such wrongful and unlawful invasion of the premises, and to continue to mine, extract and remove ores and minerals; that the defendants are in possession of a mining claim adjacent to the four mining claims of plaintiff, known as the Kempton mining claim, United States Lot 255, which was located in the year 1871, and on information and belief that the defendants pretend that the mineral deposits and ores under and beneath the surface of the four mining claims above mentioned are in and part of a mineral vein and lode belonging to and having its apex in said Kempton mining claim and on the dip of said alleged vein, which pretence the plaintiff charges to be contrary to the truth. The plaintiff further alleges that it is the owner and in possession of two certain mining claims, one named the Jordan Silver Mining Company's mine, but usually known as the Old Jordan, located December 17, 1863; the other the Mountain Gem Lode and Mining Claim, located August 20, 1864, the boundaries of each of which are given; that in these two claims there is a lode, bearing silver and other metals, whose apex is within the surface; that the dip of said lodes is toward the Kempton claim occupied by the defendants, and that if there be any mineral vein or lode in the Kempton claim it is not one that has its apex within the limits of that claim, but is a part of the lode apexing within the Old Jordan and Mountain Gem claims. The relief prayed for was a decree quieting plaintiff's title and restraining the defendants from mining and removing any ores or minerals. To this amended complaint the defendants filed a demurrer, stating, as one of the grounds thereof, that the plaintiff had an adequate remedy at law. This demurrer was overruled, and thereupon the defendants filed an answer and subsequently an amended answer, setting forth their title to the Kempton mining claim, and also to a claim known as the Ashland mining claim, and alleging that there are lodes whose apices are within these claims; that on their dip they enter beneath the surface of the plaintiff's claims, and that it is upon them

that defendants have been mining; that the Kempton claim was patented to their grantors and predecessors in interest on February 23, 1875. They further deny that the Old Jordan claim was located on December 17, 1863, or patented July 14, 1877; deny that the Mountain Gem claim was located on August 20, 1864, or that a patent had been issued on said alleged location. They further aver that if there be any lode or vein in either the Old Jordan or the Mountain Gem claims, that such lode or vein is entirely distinct from those which have their apices in the Kempton and Ashland claims. On the hearing the court denied the application of the defendants to set the case for trial as a law case before a jury. At the same time it entered a decree dismissing the plaintiff's bill. From this decree the plaintiff appealed to the Circuit Court of Appeals (67 U. S. App. 587), which reversed the decree of dismissal, and remanded the case with instructions to enter a decree for the plaintiff in conformity with the prayer of the bill. Thereupon, on application of the defendants, the case was brought to this court on certiorari.

Mr. Justice Brewer delivered the opinion of the Court.

The first question is, whether the plaintiff can maintain this suit in equity without a prior adjudication in an action at law of its legal title. The bill alleges ownership and possession. It supported this allegation by patents from the United States of the first four claims mentioned in the bill, and proved that the defendants were working on a vein or body of mineral beneath the surface and extracting ores therefrom. The bill has a double aspect, to quiet title and to restrain defendants from removing any more ores from beneath the surface of these claims. Title by patent from the United States to a tract of ground, theretofore public, *prima facie* carries ownership of all beneath the surface, and possession under such patent of the surface is presumptively possession of all beneath the surface. This is the general law of real estate. True, in respect to mining property, this presumption of title to mineral beneath the surface may be overthrown by proof that such mineral is a part of a vein apexing in a claim belonging to some other party. But this is a matter of defense, and while proof of ownership of the apex may be proof of the ownership of the vein descending on its dip below the surface of property belonging to another, yet such ownership of the apex must first be established before any extralateral title to the vein can be recognized. This suit was not in the nature of an ejectment, to put the defendants out of possession of the space beneath the surface of plaintiff's claims from which they had extracted ore, but to quiet the title of the plaintiff to the vein in which they had been working, and to restrain them from mining and removing any more ore.

Sec. 3511, Rev. Stat., Utah, 1898, reads:

"SEC. 3511. An action may be brought by any person against another who claims an estate or interest in any real property adverse to him, for the purpose of determining such adverse claim."

A statute of a similar character was before this court in *Holland v. Challen*, 110 U. S. 15, and it was held that under it a suit might be maintained by one out of possession against another also out of possession to quiet the title of the former to the premises. It was said, quoting from a prior opinion, that it was "a case in which an enlargement of equitable rights is effected, although presented in the form of a remedial proceeding." It was also said (p. 20):

"To maintain a suit of this character it was generally necessary that the plaintiff should be in possession of the property, and, except where the defendants were numerous, that his title should have been established at law or

be founded on undisputed evidence or long continued possession. *Alexander v. Pendleton*, 8 Cranch, 462; *Peirsoll v. Elliott*, 6 Pet. 95; *Orton v. Smith*, 18 How. 263.

"The statute of Nebraska authorizes a suit in either of these classes of cases without reference to any previous judicial determination of the validity of the plaintiff's right, and without reference to his possession. Any person claiming title to real estate, whether in or out of possession, may maintain the suit against one who claims an adverse estate or interest in it, for the purpose of determining such estate and quieting the title."

The same question was considered and decided in the same way in respect to a suit, based upon a similar statute, in Iowa, in *Wehrman v. Conklin*, 155 U. S. 314. Of course, as pointed out in *Whitehead v. Shattuck*, 138 U. S. 146, such a statute cannot be relied upon in the Federal courts to sustain a bill in equity by one out of possession against one in possession for an action at law in the nature of an action of ejectment affords a perfectly adequate legal remedy. There is nothing in the point decided in *Boston etc. Mining Company v. Montana Ore Company*, 188 U. S. 632, which, rightly considered, conflicts with the case of *Holland v. Challen*.

It will be further borne in mind that this question was raised by demurrer to the plaintiff's bill and by motion

nature of an action of ejectment, which was a common law action, entitling the party to a jury. But in this case upon the allegations of the complaint the plaintiff was in possession and therefore could not maintain an action of ejectment. The testimony which plaintiff offered showed that it was the owner and in possession, and, of course, at that time nothing in the nature of an action of ejectment was shown. And it was only by demurrer to the complaint and by motion after the plaintiff had rested that the question of a right to a jury was raised by the defendants. The decision of the Court of Appeals in this matter was right.

Coming now to the merits, it is not open to dispute that the defendants were taking ore from beneath the surface of the plaintiff's four claims. The question, therefore, arises what right had they to thus mine and remove ore? They must show that the ore was taken from a vein belonging to them. Was there a vein? Where was its apex, and who was the owner of that apex? The testimony is voluminous, and even with the accompanying diagram it is difficult to come to a satisfactory conclusion as to the facts.

It is insisted that the findings of the Circuit Court should have bound and concluded the Court of Appeals upon questions of fact. The difficulty with this contention is that there is nothing to show what the Circuit

Court found to be the facts. Whatever might have been suggested by the course of the argument at the hearing, the comments of the court upon such argument, or in announcing its decision, there is nothing in the record to indicate whether its decision was based upon a question of fact or a matter of law. The record only contains its decree, dismissing the bill. All else is a matter of surmise, except as may be inferred from the allegations of the pleadings and the scope of the testimony. While it is apparent that the Circuit Court must have based its decision upon one of two or three grounds, yet upon which it is not certain. The Circuit Court of Appeals made no separate finding of facts, but it filed an opinion which indicates the scope of its decision, and it is the decree of that court which is before us for consideration.

The attitude of the case is very like that of one in which a trial court refers all things to a master who takes the testimony and reports it, with a general finding for the plaintiff or defendant, upon which report the trial court states its views of the facts and the law and enters its decree. An appellate court reviewing such decree will give its consideration to the conclusions stated by the trial court, irrespective of the report of the master, unless the issue be so narrow that sustaining the decree of the court necessarily involves an overruling of the master on a matter of fact.

From the opinion of the Court of Appeals it appears that it found that there was a broad vein. It says: "A careful examination and consideration of the evidence clearly convinces us that the stratum of limestone constitutes a single broad vein or lode of mineral bearing rock extending from the quartzite on one side to the quartzite on the other." This stratum of limestone underlies the four claims of the plaintiff, and one of the contentions of the defendants is that there are several independent veins, one of which has its apex within the surface lines of the Kempton and another its apex in the Ashland, that these independent veins continue down through the stratum of limestone beneath the surface of the plaintiff's claims, and that it was only from these independent veins that the defendants were mining and removing ore. Of

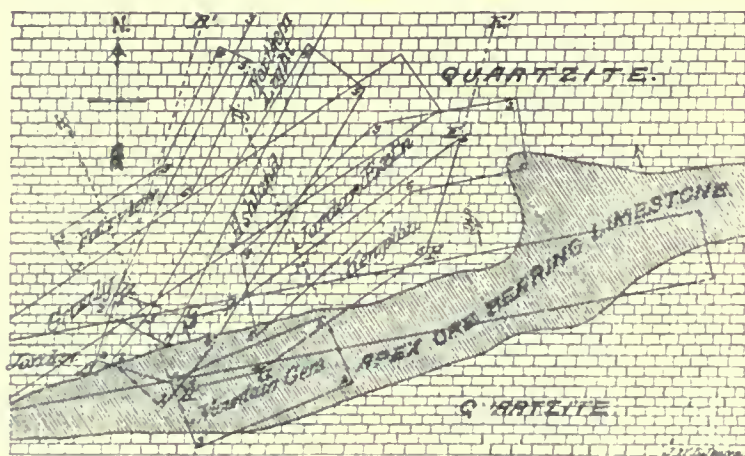


Diagram Showing Conflicting Claims.

after the plaintiff had finished his testimony and before the defendants had introduced theirs, and was not renewed at the close of the trial, although until then the motion was not decided. At the time the motion was made the case presented was one of a clear legal title to the four mining claims by patent from the United States, and an unauthorized entry by subterranean workings into the ground below the surface and the mining and extracting of ores therefrom—a case for restraint by injunction, which was part of the relief asked for in the bill. It is insisted that in *Park v. Wilkinson*, 21 Utah, 279, the Supreme Court of that State has given a different construction to the statute, but in this we think counsel are mistaken. In that case the plaintiff brought an action which the court says "was in the nature of one in ejectment." To the complaint the defendant, as authorized by the practice in Utah, answered with a cross complaint demanding equitable relief. A jury was empaneled. After the testimony was all in, the court ruled against the claim for equitable relief, discharged the jury and entered judgment for the plaintiff. This was held to be erroneous, the court saying that "after determining the equitable issue the court should have submitted the case to the jury upon proper instructions." In other words, the equitable relief sought by the defendant having been denied the case stood as one in the

course, this difference between the conclusions of the court and the contentions of the defendants affects materially the scope of the inquiry. If the limestone is not, strictly speaking, a vein, but a mere stratum of rock through which runs several independent veins, then the inquiry must extend to the location of the apex of each separate vein, whereas if the stratum of limestone is itself a single broad vein, then the inquiry is narrowed to the location of its apex.

With reference to the conclusion of the Court of Appeals it is sufficient to say that if the testimony does not show that it is correct, it fails to show that it is wrong, and under those circumstances we are not justified in disturbing that conclusion. It is our duty to accept a finding of fact, unless clearly and manifestly wrong.

Treating this limestone as a single broad vein, it is apparent that the entire apex is not within the surface of either the Kempton and Ashland, but that it is also found in the Old Jordan and Mountain Gem, the property of the plaintiff. The line which divides the surface of the claims of the defendants from the Old Jordan and Mountain Gem claims also bisects the vein as it comes to the surface. In other words, part of the apex is within plaintiff's claims and part within defendants'. In such a case the senior location takes the entire width of the vein on its dip. This was the conclusion of the Court of Appeals, as shown by this quotation from its opinion (p. 592):

"Where two or more mining claims longitudinally bisect or divide the apex of a vein, the senior claim takes the entire width of the vein on its dip, if it is in other respects so located as to give a right to pursue the vein downward outside of the side lines. This is so because it has been the custom among miners, since before the enactment of the mining laws, to regard and treat the vein as a unit and indivisible, in point of width, as respects the right to pursue it extralaterally beneath the surface; because usually the width of the vein is so irregular, and its strike and dip depart so far from right lines, that it is altogether impracticable, if not impossible, to continue the longitudinal bisection of the apex throughout the vein on its dip or downward course; and because it conforms to the principle pervading the mining laws, that priority of discovery and of location gives the better right, as is illustrated in the provision giving to the senior claim all ore contained in the space of intersection where two or more veins intersect or cross each other, and in the further provision giving to the senior claim the entire vein at and below the point of union, where two or more veins with distinct apices and embraced in separate claims unite in their course downward. Rev. Stat. Sec. 2336."

We fully endorse the views thus expressed. Discovery is the all-important fact upon which title to mines depends. Lindley, in his work on Mines, 2d ed. Vol. 1, Sec. 335, says:

"Discovery in all ages and all countries has been regarded as conferring rights or claims to reward. Gamboa, who represented the general thought of his age on this subject, was of the opinion that the discoverer of mines was even more worthy of reward than the inventor of a useful art. Hence, in the mining laws of all civilized countries the great consideration for granting mines to individuals is *discovery*. 'Rewards so bestowed,' says Gamboa, 'besides being a proper return for the labor and anxiety of the discoverers, have the further effect of stimulating others to search for veins and mines, on which the general prosperity of the State depends.'"

The two thoughts here presented are reward for the time and labor spent in making the discovery, thus adding to the general wealth, and incentive to others to

prosecute searches for veins and mines. To take from the discoverer a portion of that which he has discovered and give it to one who may have been led to make an adjoining location by a knowledge of the discovery and without any previous searching for mineral is manifest injustice.

Again, as indicated in the quotation from the Court of Appeals, continuing the line of division shown upon the surface through the descending vein would be attended with great difficulty and uncertainty. Dealing with questions of this nature, a practical view must be taken. Veins do not continue of uniform width in their descent, but are often irregular and broken, and to attempt to make a division of ore according as it appears on the surface, or equally, would require the constant supervision of a court. It is not strange, then, that the custom of miners has been, as stated by the Court of Appeals, to regard and treat the vein as a unit and indivisible in point of width and belonging to the discoverer. This question has been before this court, as well as several of the courts in the mining districts. In *Argentine Company v. Terrible Company*, 122 U. S. 478, 484, we said:

"Assuming that on the same vein there were surface outcroppings within the boundaries of both claims, the one first located necessarily carried the right to work the vein."

In *Mining Co. v. Mining Co.*, 5 Utah, 3, the question is discussed at some length by Chief Justice Zane. In the course of the opinion it is said (p. 54):

"Under the law of 1866 the surface ground was merely for the convenient working of the lode. The discoverer and first locator took the lode in its entirety. The law contemplated its segregation in its length, not in its width. It refers to lodes between the end lines, not to a part of a lode. No expression can be found in it indicating an intention to limit the rights of the locator to a portion of the lode in its width. The discovery of any part of the apex of a vein is regarded by it as a discovery of the entire apex. And we think that the law of 1872, when all of its provisions are considered together, and in connection with the former law on the subject, as it should be, evinces the same intent. Under this law the discoverer of any part of the apex gets the right to its entire width, despite the fact that a portion of the width may be outside of the surface side lines of his claim extended downwards vertically. While he has no right to the extralateral surface he has a right to the extralateral lode beneath the surface."

See also *St. Louis M. & M. Company v. Montana M. Company*, Circuit Court of Appeals (9th Cir.), 44 C. C. A. 120; *E. Idaho M. & D. Company v. Bunker Hill M. & C. Company*, Circuit Court of Appeals (9th Cir.), 52 C. C. A. 219. Also another suit between the same parties in the same court, 66 C. C. A. 99; *Last Chance M. Company v. Bunker Hill S. M. & C. Company*, Circuit Court of Appeals (9th Cir.), 66 C. C. A. 299.

But it is contended by the defendants that both the entries and patents of the Ashland and Kempton claims were prior in time to the entries and patents of the Old Jordan and Mountain Gem, and that such priority of entry and patent conclusively establishes the prior right of the owners to this broad vein; that the failure of the owners of the Old Jordan and Mountain Gem to adverse the applications of the owners of the Ashland and Kempton for patent was an admission that the latter had priority of right, and is conclusive against any present testimony as to the dates of the locations. We had occasion in the recent case of *Mining Company v. Tunnel Company*, 196 U. S. 337, to consider to what extent the issue of a mining patent worked an estoppel of the claims

of third parties, and it is unnecessary now to repeat the discussion there had.

This case presents the question under different aspects. The entries and patents of the Ashland and Kempton claims were, as stated, prior in time to the entries and patents of the Old Jordan and Mountain Gem. There is no record of any adverse suits, although it is intimated that there were such suits. In the absence of a record thereof we cannot assume that anything more was presented and decided than was necessary to justify the patents. A patent is issued for the land described and all that is necessarily determined in an adverse suit is the priority of right to the land. This is evident from the section, 2325 R. S., which says: "A patent for any land claimed and located for valuable deposit may be obtained in the following manner." In the section the only matters mentioned for examination and consideration relate to the surface of the ground. There is no suggestion or provision for any inquiry or determination of subterranean rights. Lindley, in his work on Mines, second edition, Vol. 2, Sec. 730, says:

"An application for patent invites only such contests as affect the surface area. A possible union of veins underneath the surface cannot be foreshadowed at the time the application is made. When such a condition arises, it is adjusted by reference to surface apex ownership and priority of location not involving any surface conflict. The rule is well settled that conflicting adverse rights set up to defeat an application for patent cannot be recognized in the absence of an alleged surface conflict. Prospective underground conflicts are not the subject of adverse claims."

In *New York Hill Company v. Rocky Bar Company*, 6 L. D. 318, the Commissioner of the General Land Office declined to recognize an adverse claim where there was no surface conflict, saying (p. 320):

"In the event that patent should be issued upon said application and any question should thereafter arise as to the right under such patent to follow any vein or lode, as indicated in sec. 2322, it would be a matter for the courts to settle, and I am of the opinion, there being no surface conflict alleged in this case, and without considering any other question relating to the sufficiency of the so-called adverse claim, that you properly declined to receive the same as an adverse claim, and to that extent your decision is affirmed."

The same ruling was made in *Smuggler Mining Company v. Trueworthy Lode Claim*, 19 L. D. 356.

Without determining what would be the effect of a judgment in an adverse suit in respect to subterranean rights, if any were in fact presented and adjudicated, it is enough now to hold that there is no presumption, in the absence of the record, that any such rights were considered and determined. Indeed, in the absence of a record, or some satisfactory evidence, it is to be assumed that the patents were issued without any contest and upon the surveys made under the direction of the United States surveyor general, and included only ground in respect to which there was no conflict. If the surface ground included in an application does not conflict with that of an adjoining claimant, the latter is in no position to question the right of the former to a patent. Take the not infrequent case of two claims adjoining each other, the boundary line between which is undisputed. If the owner of one applies for a patent the owner of the other is clearly under no obligation to adverse the application, even if under any circumstances he might have a right to do so. Other necessary conditions being proved, the applicant is entitled to a patent for the ground. Generally speaking, if the boundary between the two claims is undisputed, the foundation for an adverse suit is lack-

ing. While a patent is evidence of the patentees priority of right to the ground described, it is not evidence that that right was initiated prior to the right of the patentee of adjoining tract to the ground within his claim.

Section 2336, R. S., makes provision for conflict as to certain subterranean rights. The last sentence of the section reads: "And where two or more veins unite the oldest or prior location shall take the vein below the point of union, including all the space of intersection." *Argentine Company v. Terrible Company*, *supra*. As the place of union may be far below the surface, this evidently contemplates inquiry and decision after patent, and then it can only be in the courts. And the same rule will obtain as to other subterranean rights.

It is further contended that there is no evidence of a valid location of the Old Jordan and Mountain Gem prior to the entries of the Ashland and Kempton. Location notices of the Old Jordan and Mountain Gem were admitted in evidence, that of the former being as follows:

"Notice. Jordan S. M. Co.

"The undersigned members of the Jordan Silver Mining Co. claim for mining purposes one share of two hundred feet each and one additional claim of two hundred feet for original discoverer, George R. Ogilvie, on this lead of mineral ore, with all its dips, spurs and angles, beginning at the stake situated one hundred feet northeast of Gardner's shanties in Bingham (Canyon) Canyon, in West Mountain, and running two thousand two hundred feet in a westerly direction along the side of said mountain, on a line with Bingham Canyon, and intend to work the same according to the mining laws of this mining district.

"(Signed by 25 locators.)

"Bingham Canyon, Salt Lake City, Utah Territory Sept. 17, 1863.

"A. GARDNER, Recorder."

The Mountain Gem location was similar in form, dated August 20, 1864, and recorded August 24, 1864. Now these location notices were long before the time of the locations of defendants' claims. It is further contended that the locations of the Old Jordan and Mountain Gem were anterior to the act of July 26, 1866 (14 Stat. 251), which was the first legislation of Congress in respect to the granting of mineral claims, and that while that act in its second section recognizes the rights of locators in so far as they have proceeded according to the local custom or rules of miners of the districts in which the mines are situated, yet in this case there is no evidence that these locations were made in conformity to any such local custom or rules. It is sufficient to say that by stipulation of counsel it was agreed that the patents to the Old Jordan and Mountain Gem were issued upon the location notices. Inasmuch as they were accepted by the Government, and patents issued thereon it was a recognition by the department of the conformity of the proceedings to the local rules and customs of the district, and such ruling is not open to challenge by third parties claiming rights arising subsequently to such notices.

Summing up our conclusions, the findings of fact as stated in the opinion of the Court of Appeals are not clearly against the testimony, and must, therefore, be sustained. According to those findings there was a single broad vein—the apex or outcroppings of which extended through the limits of some of the plaintiff's and defendants' claims—and not several independent veins. The ore which was being mined and removed by the defendants was taken from this single broad vein beneath the surface ground of claims belonging to the plaintiff. Where there is a single broad vein whose apex or outcroppings extend into the adjoining mining claims the discoverer has an extralateral right to the entire vein on

its dip. Acceptance by the Government of location proceedings had before the statute of 1866, and issue of a patent thereon, is evidence that those location proceedings were in accordance with the rules and customs of the local mining district. The priority of right to a single broad vein vested in the discoverer is not determined by the dates of entries or patents of the respective claims, and priority of discovery may be shown by testimony other than the entries and patents. In the absence from the record of an adverse suit there is no presumption that anything was considered or determined except the question of the right to the surface.

From these conclusions it is obvious that the decision of the Circuit Court of Appeals was right; and it is affirmed.

Mineral in Underground Waters.

The chemical characteristics of underground waters depend mainly upon the composition of the rocks with which they have come in contact, varying from point to point according to local conditions. The composition of the waters not only indicates the character of the rocks but determines the use to which particular waters may be put. In fact a knowledge of the significance of the mineral constituents of any water is essential to a proper appreciation of its value and the limitations of its use. The water analyses made in the laboratory of the United States Geological Survey determine the following elements, whose significance and effects are briefly described in the following paragraphs:

Silica, a constituent of a great variety of substances, is present in large amounts in nearly all rocks except limestones and is contained in measurable quantities in nearly all underground waters. The amount ordinarily held in waters is too small to be injurious to health or objectionable in the majority of industrial processes; but the mineral forms a part of boiler scale and on this account it is undesirable in waters used for steam-making.

Iron is a constituent of most rocks and is dissolved to a slight extent by percolating water. Four or five parts per million of this substance render water unpalatable, and two or three parts per million are distinctly recognizable by taste. The iron is generally precipitated on exposure of the water to air, forming a brownish coating on the sides and bottom of the containing vessels and a scum on the surface of the water, but leaving the water itself almost free from iron at the completion of the process. Water containing much iron is very objectionable in laundries, bleacheries, textile factories, and paper mills, because the element distinctly discolors white fabrics and interferes with the coloring of tinted varieties. In the manufacture of fermented beverages iron produces a dark-colored brew that is unattractive in appearance. Iron also causes trouble in water pipes by the development of micro-organisms that secrete this substance and form a reddish slimy deposit that clogs small pipes and frequently is discharged through faucets. Iron forms part of the scale in boilers, though the amount that may be present is small in comparison with that of other incrustants.

Aluminum is a constituent of practically all rocks and forms a large proportion of shales. It unites with lime to form boiler incrustations. It is relatively inert and is harmless to health in the small amounts that are ordinarily present.

Calcium is present in a great variety of rocks. It is one of the chief ingredients of limestones and consequently it predominates in waters draining such deposits. It causes great trouble in boilers, where it forms a deposit that seriously affects their efficiency. If carbonates

predominate in the water, the deposit is a soft bulky sludge that is not troublesome if it is frequently removed by 'blowing off.' If, however, sulphates are present, a hard scale is formed that clings tenaciously to the surfaces on which it is deposited.

Magnesium is commonly associated with calcium in rocks, but generally occurs in smaller amounts. Although its compounds are more soluble than those of calcium it is usually present in ground waters in smaller quantities. It is a more objectionable constituent of boiler waters than calcium. It forms denser and harder scales, especially when precipitated with calcium carbonates, with which it unites in a hydrated incrustation that is as hard as porcelain. Its compounds are also readily decomposed, so that the acid radical attacks the boiler-plates.

Calcium and magnesium are always present in underground waters and are the chief bases in the drainage from limestone regions. They are the so-called 'hardening' constituents, and as such are undesirable in waters employed for general industrial uses, especially in laundries, textile mills, and soap factories, where they form an insoluble soap and thereby greatly increase the consumption of the detergent. In dye works the alkaline earth compounds interfere with the coloring matters.

Sodium and potassium occur in nearly all rocks and are present in greater or less amounts in ground-waters. The compounds of these two elements form no part of the scale in boilers because they are readily soluble in waters, hot or cold. On the other hand, on account of the acid radicals which accompany them, they are the cause of foaming and corrosion. Strong solutions of the carbonates cause foaming, but are not specially corrosive. The sulphates often associated with the alkalies are both foaming and corrosive.

Chlorine has an important corrosive action whatever base may be associated with it. Water containing over 100 parts per million of chlorine is poor for boiler purposes. In water for drinking chlorine is harmless.

The total solids in a water depend largely on the character of the rock it traverses and the intimacy of contact of the percolating waters with it. They are lowest when the waters have just entered the rocks and highest when they have been imprisoned for a long time. They are smallest in porous quartz sandstones and highest in fine-grained shaly rocks, through which waters pass with difficulty. In general it may be said that the smaller the amount of dissolved mineral matter in the water the better it is for steaming and for general industrial purposes.

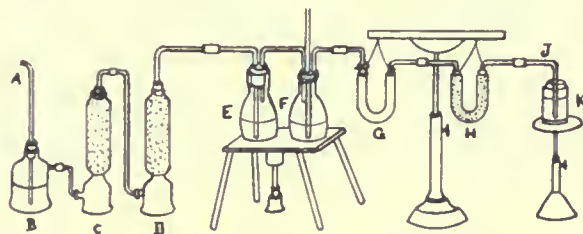
MICA IN ONTARIO.—It is reported that at Sydenham, Ontario, 16 miles from Kingston, is situated the largest mica mine in the world. The product is mostly amber mica, with some silver amber, the highest quality mined. The mine is one mile from the upper end of Sydenham lake, and the mica is transported in bulk from the mine by barge to the railroad at Sydenham, where it is shipped to Ottawa for trimming for the market. From Ottawa it is exported to the United States and other points. This mine is owned and worked by Americans, and the output is almost entirely taken by American electric companies.

MANGANESE FROM BRITISH INDIA.—Of the exports of manganese ore from Madras, India, during 1906, the United States bought to the value of \$245,000—a little more than half of the value of that ore shipped to the United Kingdom, while Belgium took a little more than half as much as the United States.

Determination of Fluorine.

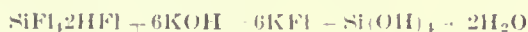
Written for the MINING AND SCIENTIFIC PRESS
By C. A. UEBERLEIN.

In the presence of carbonic acid, organic substances, and chlorine, the following method may be used by changing the fluorine into SiF_4 , decomposing the same with water, and titrating $\text{SiF}_4 \cdot 2\text{HF}$ with a normal alkali solution. The apparatus to be used is as follows: With a gasometer, air is passed through the wash-bottle *B*, filled one-half with concentrated H_2SO_4 . The cylinders *C* and *D* are half filled with sodium-calcium oxide ($\text{Na}_2\text{O} + \text{CaO}$) in the form of small pieces, and the other half with fused calcium chloride. Bottle *E* of 250-c.c. capacity serves for the decomposition of the fluorine mineral. The rubber cork of bottle *E* has two holes. Through one, the longer tube connects with the air-supply and reaches into the liquid, in which the decomposition is performed, while the shorter tube connects with the bottle *F* filled with concentrated H_2SO_4 , into which reaches a thermometer for reading the temperature. Both bottles stand on an iron plate to be heated by a gas or alcohol lamp. The U-tube *G* is empty and



perfectly dried and connected with U-tube *II*, the front half of which is filled with small pieces of fused calcium chloride, and the back half filled with small pieces of pumice, saturated with dehydrated sulphate of copper, serving to absorb H_2SO_4 and HCl carried over. The dried fluosilicon passes through the dried glass tube *J* into the beaker *K*, the bottom of which is covered with metallic mercury. It is important that this tube touches the mercury to cause constant bubbles and of a small diameter. The pressure in the apparatus must not be too great, as otherwise the bubbles pass off violently and undecomposed fluosilicon may pass over.

To prevent choking of the tube *J* it is necessary to remove from time to time the silica, deposited in the form of a ring, by means of a platinum wire. After the apparatus has been tested as to its tightness, the fluorine mineral is placed with 15 times its own weight of burned quartz powder into the bottle *E* and 40 c.c. of concentrated cold H_2SO_4 is added. Beaker *K* is filled with 150 c.c. water. After the connection is made again, an air current is passed through with one or two bubbles per second. Now the temperature is raised gradually up to 160°C . After the decomposition in bottle *E* is finished, the flame is removed and the bottle *E* is cooled down and for one hour an air current passed through the apparatus. Now cochineal tincture is added and $\text{SiF}_4 \cdot 2\text{HF}$ is titrated to strong alkaline reaction.



1 c.c. normal KOH equals 0.0190 gm. Fl.

FLUORINE IN CALCIUM FLUORIDE.

Substance.	c.c. KOH.	Found.	Calculated.
0.3 gm.	7.65	48.45	48.72
0.4	10.20	48.45	
0.3	7.65	48.45	
0.3	7.65	48.45	

Mechanical Mixture of CaFl_2 Na_2CO_3 .

	KOH.	Found.	Calculated.
0.6 gm.	7.60	48.13	48.45

What Happens When Advertising Stops.

The following suggestive comment appeared recently in *The Philistine*. It has been reprinted by the Minneapolis Steel & Machinery Co., as a forcible example of the value of advertising. If it were not true it would be uninteresting; because it is undoubtedly true it is worth reading.

Time was when the Mammoth Cave of Kentucky was one of the wonders of the world. The Cave is there yet, but only colored picnic parties go there now, or possibly an occasional person wanders thither because he remembers how, in days ago, his father and mother made their wedding journey here, and then came home and talked of it for the rest of their lives.

Records can be seen at the Mammoth Cave hotel showing the exact number of persons who have visited the Cave since this hotel was opened in 1837. It is worth while to note that in the year 1844 an average of 93 persons per day were shown the wonders of the Mammoth Cave, while in 1905 the average, not counting local picnic parties, was less than a dozen. In 1844 the population of the United States was less than twenty millions, and there was not a railroad in the State of Kentucky. And yet people came here from all the New England and Middle States by the hundred. Edward Everett guided a party of New England school teachers here in the summer of 1847. They came by way of Pittsburg, taking a steamer thence to Owensboro, Ky., and then by stage a two days' ride—80 miles—to the Cave.

The hotel is here now practically as it was then, and one can easily believe that no new furniture has been added. From 1840 to 1870 scarcely a person of note then living but visited the Cave; it was a sort of finishing touch to one's education, and people who could not talk intelligently of Niagara Falls and the Mammoth Cave, had no standing in polite society.

Everett gave lectures at Harvard on the Mammoth Cave. Webster gave a great speech at the Cave in 1851, and Emerson, in his essays, several times refers to his visit here, telling of the fish that have no eyes to see. Barnum brought Jennie Lind here, and she sat in a stalagmite chair that is now proudly pointed out by the guides. From the year 1850 to the breaking out of the war in 1861, there were held over 300 conventions of learned societies, college alumni, and gatherings of prominent people from all over the world.

It is worth while to note the stern fact that even the wonders of creation do not actually attract any special attention unless some advertising man gets busy. The railroads really make Niagara Falls go. They are advertising it continually as a continuous performance, and filling people with a desire to go there, then transporting them for a consideration.

In 1869 the man who owned the Mammoth Cave died, and since then the Cave has been an orphan. There were 13 heirs scattered in different cities throughout the United States, all intent on spending the beautiful income that was forced upon them from this magnificent paying property.

Every person who went into the Cave paid \$2 for the privilege—it was a monopoly. People would come, of course; there was no other Cave to go in.

But soon the people ceased to come.

The advertising man was dead.

Humanity slipped back into indifference. They forgot to think of caves or gently pool-pooled them. Caves are not necessary to human happiness. Caves are not necessary until some man by astute advertising fills us with the desire to see them.

Copper in Chloride Solutions.

By GUSTAVE FERNEKES.

*During the winter of 1906-07, A. C. Lane, State Geologist of Michigan, requested me to make analyses of the waters of the Lake Superior copper mines for the purpose of determining whether these waters could in any way be connected with the genesis of the copper deposits in that region.

A series of analyses was made upon samples from various mines from depths ranging from 800 to 5,000 ft. It appears from these analyses that the waters are more or less concentrated solutions of calcium chloride, sodium chloride, and sodium bromide, with traces of sulphates. Furthermore, the concentration of these solutions increases with the depth. Upon reading an account of the very interesting experiments of Stokes in which metallic copper was precipitated from copper sulphate solution by means of ferrous sulphate, it occurred to Lane that similar results might be obtained when the chlorides instead of the sulphates of the above metals were used.

Preliminary experiments carried out according to the method of Stokes, however, gave negative results, that is, no copper was deposited. The cause of the failure is due to the fact that metallic copper is soluble in hot dilute hydrochloric acid, whereas dilute sulphuric acid which was set free in Stokes' experiments has absolutely no effect upon the copper. The following reactions, published by Lane, show the change which takes place:

1. $2\text{FeCl}_2 + 2\text{CuCl}_2 = \text{Cu}_2\text{Cl}_2 + 2\text{FeCl}_3$.
2. $2\text{FeCl}_2 + 2\text{CuCl} = 2\text{Cu} + 2\text{FeCl}_3$.

The ferric chloride is then hydrolyzed according to the following well known reaction:

3. $\text{FeCl}_3 + 2\text{H}_2\text{O} = \text{Fe}(\text{OH})_2\text{Cl} + 2\text{HCl}$.

Reaction 3 takes place at high temperatures and fairly dilute solutions. The reactions which take place in the experiments of Stokes are similar to the above. As he used the sulphates instead of the chlorides, free sulphuric acid instead of hydrochloric acid was formed.

As only traces of sulphates were present in the waters examined, and they are rare in the rocks and minerals of this region, more careful attempts to precipitate the copper from the chloride solutions seemed justifiable. To make the precipitation of copper possible according to the above reactions, the hydrochloric acid must be constantly neutralized. This neutralization can be brought about by the carbonates or silicates of calcium and sodium. Calcium hydroxide was first tried, then calcium carbonate, and finally calcium silicate in the form of the mineral wollastonite. The experiments were successful, the copper being deposited in from 10 to 15 minutes heating at 200° C.

Complete precipitation required a somewhat longer time. It is evident that the more soluble the neutralizing mineral is in hydrochloric acid the more efficient it is for rapid neutralization and consequent precipitation of the copper. It also seems probable that we would be able to obtain crystalline copper more readily if a slower neutralization took place than in the above experiments, where in fact the copper came down in a fluffy condition.

At this point Lane suggested the following minerals, common in this region, which may have taken part in the neutralization of the free acid: Labradorite, prehnite, laumontite, datolite, analcite, and pectolite. Of these minerals the first three were present in the rocks before the copper deposits were formed and the last three are closely associated with the metal. The first four minerals

were tried, but positive results were obtained only with prehnite and datolite. Since the conditions of the experiments, as finally carried out, were slightly different from those described by Stokes, it may be well to mention a few of the modifications introduced. Instead of employing a metal bath as did Stokes, an ordinary sand-bath was used. The thermometer was placed alongside of the sealed tube containing the solutions. As explosions are not frequent, this arrangement is perfectly satisfactory. The total length of the tubes employed was also greater, being about 18 in. The upper limb of the tube was surrounded by a water-jacket. The temperature of the lower limb ranged from 200° to 280° C. The material was introduced into the tube in the following order: First, about five grams of the neutralizing mineral, finely ground and freed from possible admixture of copper by treatment with nitric acid; then 0.2 grams of copper chloride; and finally a solution of ferrous chloride, containing an excess over that required to precipitate all of the copper. A few crystals of potassium bromide were also added. The solution, which was always slightly acid, due to the ferrous chloride, was then almost neutralized by the addition of sodium carbonate, filled to the top with water and sealed.

In the case of prehnite, perfect circulation of the liquid above the mineral continued for about five hours when heated to 200° C. At the end of this time the basic iron salt formed in the reaction covered the small surface of the exposed prehnite to the height of two to three centimetres and consequently further action proceeded very slowly. Occasional cooling of the lower limb of the tube was therefore resorted to, and by this means the solution was drawn back into the mineral, constantly exposing new surfaces. The tubes were heated intermittently for 10 hours during the day. The heat was removed in the evening and again applied the next morning. After heating the solution and prehnite in this manner for five days, an explosion took place at about 250° C. A portion of the side of the tube about five centimetres from the bottom was blown off, leaving a fairly hard cake underneath. On examining this cake of mineral with a small hand lens, it was found to be interspersed with shiny particles of crystalline copper. A few chemical tests were made. The particles were soluble in nitric acid with the evolution of brown fumes. They were insoluble in dilute hydrochloric acid, which fact distinguished them from cuprous oxide, and they precipitated metallic silver from neutral silver nitrate solution. The prehnite had become much darkened and the particles of the mineral were stained red in places with iron oxide.

Datolite was acted upon in a similar manner for six days, at the end of which time minute crystals of copper could be detected throughout the mass of the mineral. Experiments with laumontite and labradorite have up to the present time been unsuccessful and lack of time prevents me from carrying out more extensive researches in this direction.

It is not the object of this paper to draw any geological conclusions, especially as so few experiments have been performed. Nevertheless the work may be of value in reference to the genesis of copper deposits in the Lake Superior region. It is possible that hot solutions of copper and ferrous chlorides acted upon each other with the liberation of free hydrochloric acid as in the foregoing experiments. The hydrochloric acid acted upon the surrounding rock, consisting principally of calcium and sodium silicates, and a neutralization was effected. Simultaneously with this neutralization the copper was precipitated. Calcium and sodium chlorides were left in solution (mine waters), and silica was precipitated as quartz. Possibly the temperatures and pressures were far higher than those in the experiments.

*Abstracted from an article entitled 'Precipitation of Copper from Chloride Solutions by Means of Ferrous Chloride,' in *Economic Geology*, Vol. 11, No. 6.

From these considerations one might expect that the relation of the calcium to the sodium would be the same as that existing in the original igneous rock. No such relation has thus far been determined. The analyses differ materially with the locality and depth of the samples.

The following analyses of typical mine waters show the relation of sodium to calcium with varying depths, the results being given in grams per litre:

It may be seen that the sodium in the upper level of the Centennial mine is in excess of the calcium, whereas in the lower level the quantity of calcium is about six times that of the sodium.

	I.	II.	III.
Cl	17.73	5.780	3.549
Ca	8.75	1.880	0.880
Na	1.49	1.584	1.287
Br	0.224	.....	.....
SO ₄	0.0123	.....	.....
Total	28.21	9.244	5.716

I. From Quincy mine, No. 6 shaft, 33rd level. Depth about 5,000 ft.

II. From the 20th level of the Centennial mine. Depth about 2,000 ft.

III. From the 11th level of the Centennial mine. Depth about 1,100 ft.

Although it is generally true that the calcium in the volcanic rock is considerably in excess of the sodium yet no average of a great number of analyses is available.

Results of analyses of traps are cited in Vol. 6, Part 1, of the Michigan Geological Survey. The amount of CaO varies from 7 to 10%, and the NaO from 3 to 5%. Further work along this line will be carried out when time permits.

RUST PREVENTIVE.—An option on the American rights to a patent process called 'sherardizing,' which it is asserted makes iron and steel rust-proof, has been sold to a firm in New York. It is claimed for this process that it coats iron and steel with zinc as well as or better than ordinary wet galvanizing, and that the iron and steel thus coated can be brilliantly polished. In the process, zinc dust is placed in a cylinder which has been brought to a temperature of 400 to 500° F; that is, below the melting point of zinc. The articles it is desired to 'sherardize' are put into the cylinder, which is then revolved. The zinc in this process is not actually melted, but forms an alloy through the surface of the articles absorbing the zinc, and then a coating covering the whole visible surface is deposited to any desirable thickness. Articles thus treated are said to have an even and adherent coating that wears excellently and does not strip, and which, by the use of a lime mop, are easily polished. It had been found that the use of the wet galvanizing process upon articles on which threads are cut made it necessary afterward to recut the threads. This, it is claimed, is obviated in the new process, thus avoiding both the additional work of recutting the threads and also making the threads themselves rust-proof. Another advantage claimed is that because articles are not heated to a high temperature the temper of the steel is little affected, while its tensile strength and that of iron remains the same. Aluminum and antimony can be substituted, it is said, for zinc, with success, while when copper and its alloys are subjected to this process their surface is so hardened as to even turn the edge of a steel tool.

VANADIUM STEEL.—The United Steel Co. is making vanadium steel in its 50-ton basic furnaces in a commercial way. Vanadium steel has never been made in the United States before except in experimental furnaces and in crucibles. The company recently made a heat of about 30 tons, which, it is stated, is the largest heat which has ever been made in America or elsewhere.

Furnace-Charging.

Written for the MINING AND SCIENTIFIC PRESS
By G. F. BEARDSLEY.

All blast-furnaces are sensitive as to the manner in which the charge is delivered into them. The managers of iron furnaces have put more study on this subject than the copper men and this has resulted in the production of efficient mechanical methods for feeding the iron furnace. On copper furnaces hand-feeding has been all but abandoned, giving way to so-called mechanical feeding. This usually consists in tipping the materials forming the charge into the side of the furnace from small cars having V-shaped bowls. So long as there is ample copper and sulphur for the matte-fall and the furnace runs all right the practice is good. Its faults obtrude only when ores low in those two elements have to be treated.

The following remarks refer to observations made at a copper plant where it became necessary, in the re-modeling of it, to provide for the handling of an increased tonnage. To that end small furnaces were discarded for those of a larger type. With the exception of the arrangement for the mechanical feed but little change was made in the furnace proper. The width was increased from 42 to 48 in. and the length, from 150 to 240 in. The 12-in. bosh in the two furnaces commencing 9 in. above the tuyeres were replaced by a 9-ft. straight jacket resting directly on the sole-plates and inclined outward at an angle of 7½°. Relatively, the number of tuyeres was increased and consequently the amount of air sent into the furnace was also increased. What proved to be the greatest change was the method of delivering the charge into the furnace. It was found that the angle and length of slope of the apron-plate, over which the charge was slid into the furnace, controlled the amount of sulphur burned or oxidized. The older furnaces were essentially hand-fed, that is, barrow-fed, and evened up or corrected by shovel-work. These furnaces had a comparatively short slope, the exact length of which is not to hand. In the new furnaces the slope was extended back, outside the line of the hood or top of the furnace, to a point where it would be under the lip of the V-shaped bowl of the charge-car when it was tipped over. The length of the slope was 4 ft. 2 in. and the angle of inclination 10°. As the ore slid out of the tilted bowl a separation took place. The coarse portions of the charge bounded down the long slope and plunging into the furnace, rolled down a central ridge to the side opposite the charge-car and brought up against the jackets. The finer material, meeting with a greater frictional resistance on the plate, ran more slowly and poured off the edge of the plate with just sufficient impetus to land in the centre of the furnace forming the above-mentioned ridge. The result was that the greater part of the blast came up alongside the jackets through the coarse material, leaving a central core, more or less dead. Slight raising of the charge produced the opposite effect, for when the central ridge was brought up a little, it acted as a dam; the charge backing up onto the slope of the plate and gradually sliding down as the charge sank put all the fine material against the jackets forming crusts. It was early found that the furnace had to be fed at just the proper height to avoid this crusting, though the crusts were fairly easy to bar off and were readily cut away by feeding an excess of sulphur ore when it could be spared.

The ores treated were naturally fluxed but they were so low in sulphur that there was at all times only barely enough of that element to furnish the required matte-fall. The ores had, in addition to the gold and silver, the following approximate percentage composition:

SiO₂, 31; Fe, 18; CaO, 18; Al₂O₃, 13; S, 3.3; Cu, 1.4.

In operating the old furnaces it was noted that when there was about 3½% of sulphur present, there was matte-fall enough to keep the slags between 0.3 and 0.4% copper and the matte between 40 and 50%. When the new furnaces were put in commission it was found that between 4 and 5% sulphur had to be maintained in the charge to get the same results in the slag and matte. Deficiency in sulphur gave high mattes and consequently high slags. A certain matte-fall was also necessary to keep the furnace in proper working condition. To supply the sulphur deficiency quite a quantity of poor pyrrhotite had to be obtained from an outside source. This, added to the charge, considerably increased the smelting cost.

Undoubtedly the new furnaces were oxidizing more than the old ones and a hunt was begun to find the cause. Suspicion was turned successively to the shape of the furnace, the increase in the amount of air sent in, the condition of the blast, the furnace feeders, the size and rotation of the charge components, and, lastly, the fall of the ore in the furnace. After observing the hand-feeding at one plant where they were doing cleaner work under poorer conditions and the mechanical feeding at another, where an entirely different method was in use, the general manager decided to hang two deflecting plates longitudinally in the furnaces, in such a position that the coarse part of the charge from each side would be dropped straight down and thus prevented from crossing it and lodging against the opposite jackets. Although the segregation took place on the slope much the same as before, there was a re-adjustment under the deflecting plates, equal in effect to, if not better than, the non-separation of the original coarse and fine material. The effect of the deflecting plate was immediately manifest in faster driving, increased matte-fall, lower grade of matte, cleaner slags, and a great reduction, or the cutting out entirely, of the amount of outside sulphur material and its replacement by a payable ore.

In the early days of lead smelting the smelters were prodigal of iron. Nowadays a premium is paid for it. A decade ago sulphur was not wanted in any ore and it was roasted to get rid of it. Under some conditions this is still being done. There are many places, however, where ores lean in copper and sulphur are being smelted and where 2% of sulphur is the difference between easy work and saving, and hard work and loss. More than ever must furnaces be suited to their work. Builders and designers of furnaces will do well to consider this point when the question of smelting ores low in sulphur is concerned.

The side feed on a sloping plate will always produce more or less of a segregation where there is a mixture of coarse and fine material. The separation producing open and tight areas in the charge, increases the oxidation of sulphur and cuts down the reducing effect of the coke. While the deflecting plate in this case overcame, to a large extent, a fault that was not or could not well be foreseen in the original design, it is not a good arrangement, inasmuch as it is more or less in the way, subject to considerable wear and tear, and to curling and warping by heat. The best arrangement for car-feeding a furnace is that designed by A. B. W. Hodges, general manager of the Granby smelter in British Columbia. This is a car run directly into the end of the furnace. In section it is roughly like the letter W with short straight sides on the wings and in the centre of the letter. In the hollow under the W is placed the truck, which runs on the floor-rails. At the four corners of the car, on the top edge are placed lugs also carrying small car-wheels. The latter engage a cast-iron rail built into the brickwork on the inside of the furnace. The two tracks are so arranged

that as the car enters the furnace, the suspension rail engages the top wheels of the car and takes the load a little before the car leaves the floor-rails. There are two or three cars in the charge-train. At the ore-bins they are loaded by means of a long and short chute and the weights are adjusted by adding or removing a small portion of material. At the furnace a jerk of a rod in the hands of the feeder liberates any or all doors of the car as may be desired. The car-doors form the outside wings of the W and can be set to deflect the charge toward the centre or let it go against the walls of the furnace as called for by the condition of the top of the charge. The cars are in the furnace from one-half to three-quarters of a minute and out of the furnace from 8 to 15 minutes, as near as my memory serves. The motorman and a switchman operated the charge-train. There was a loader at the bins.

GLASS POLES.—Patents have been granted in Germany and other European countries and also in the United States, for an invention for the manufacturing of glass telegraph and telephone poles. A stock company has been organized and a factory for the manufacturing of glass poles has been built at Grossahnerode, in Germany. The glass mass of which the poles are made is strengthened by interlacing and intertwining with strong wire threads. One of the principal advantages of these poles would be their use in tropical countries, where wooden poles are soon destroyed by the ravages of insects and where climatical influences are ruinous to wood. The selling price of the poles has not been fixed yet, but the company is willing to accept \$6 for a pole 23 ft. long.

The Prospector.

Enquiries sent to this department are answered free of charge, if submitted by subscribers who are not in arrears. The full name and post-office address of the sender must be given, otherwise no answer will be made. Those who are not subscribers must accompany their questions with a fee of \$3 for each question. No assays are made.

W. W. C., of Galice, Ore., sends: No. 1, Molybdenite; No. 2, Chalcopyrite in quartz.

The specimen from Nevada City, marked S. C. L., is Galena with some Chalcopyrite.

H. A. McQueen, of Rebel Creek, Nev., sends a piece of Schist containing divergent Arsenopyrite.

The white mineral is Barite and the blue one Dumortierite in quartz, received from F. F. W., of Pacific Grove.

Rocks from Cumpas, Mex., marked Mpls, are: No. 1, Porphyrite; No. 2, contact metamorphic rock with Pyrite; No. 3, Porphyrite.

The pieces sent by J. P. P., of St. Louis, Mo., are: Barite, Tetrahedrite, and luminescent Sphalerite, described in this journal 1904 Vol. 88, p. 64.

Rocks sent by J. W. A., of Pioche, Nev., are: No. 1, Quartzite Breccia with a ferruginous cement. There is no evidence that it is volcanic. No. 2, Kaolin.

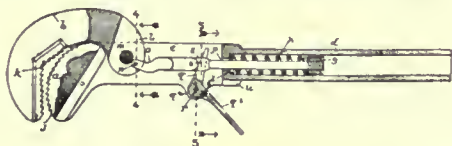
The specimens from Rawhide, Nev., marked G. M. A., are: No. 1, Quartz with Limonite; No. 2, Quartz with auriferous Pyrite, No. 3, Quartzite with Pyrargyrite.

W. B. H., of San Francisco, sends No. 1 to 3, Serpentine with native Copper; No. 4, impure Serpentine with oxidized Pyrite; No. 5, Talcose Schist with bands of Pyrite.

MINING AND METALLURGICAL PATENTS.

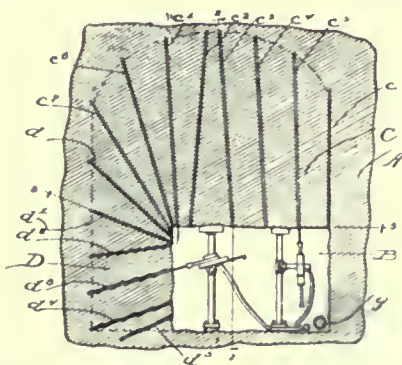
Specially Reported for the MINING AND SCIENTIFIC PRESS.

PIPE-WRENCH.—No. 868,126; Joseph E. Richards, Melrose, and Charles W. Walker, Boston, Mass., assignors to Ireland Pipe-Wrench Company, Portland, Maine.



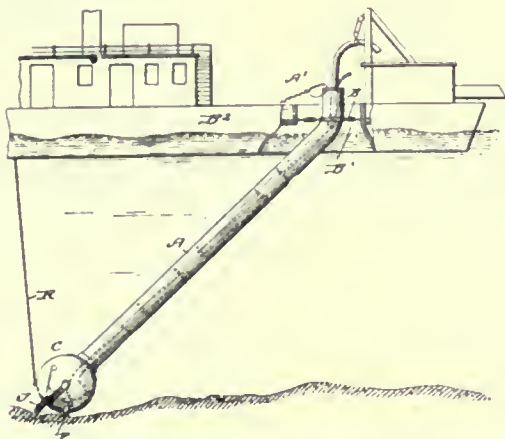
A pipe-wrench constructed of a tubular-handle; a chambered-shank in continuation of and in one piece with said handle; a pipe gripping-jaw fixed at the outer end of said shank; a pipe-gripping jaw fulcrumed on said shank; a rod at one end-portion pivoted on said fulcrumed-jaw and at its other end-portion entered into said tubular-handle; a head rigidly fastened to said rod within and loosely fitting the bore of said handle; a coiled-spring confined end to end between said head and a shoulder at one end of the tubular-handle, and a lever fulcrumed on the chambered-shank and at one end-portion straddling the said rod lying there-within, and arranged for a bearing at its opposite sides on shoulders of said rod, all as particularly described and for operation as specified.

METHOD OF EXCAVATING ROCK TUNNELS.—No. 868,259; Patrick Ford, Chicago, Illinois.



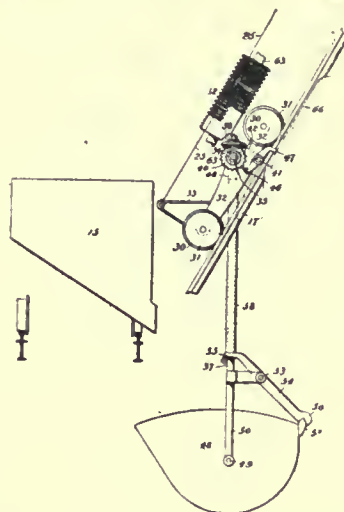
The method of excavating rock tunnels comprising first constructing an under heading for the length of the tunnel and then arranging the air and the pipe lines close to the wall of the heading then throwing down the material from the roof of said tunnel into said heading and operating at either or both ends of the tunnel.

DREDGING APPARATUS.—No. 867,984; Simon Lake, Bridgeport, Connecticut.



A dredging apparatus, comprising a submergible tube, having a working chamber at its lower end, and a suction apparatus arranged in connection with and operable from the working chamber and adapted for delivering material of the upper end of the tube through said tube.

BLAST-FURNACE-CHARGING DEVICE.—No. 868,506; Charles P. Turner, Harrisburg, and John W. Dougherty, Steelton, Pennsylvania.



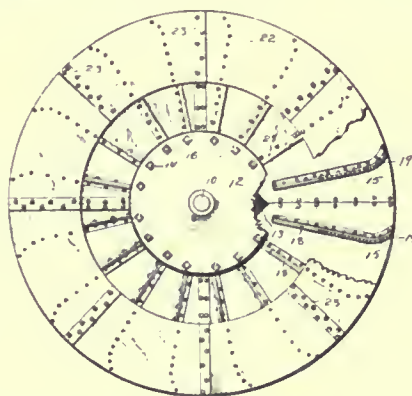
In a furnace-charging device, the combination with a buggy of a bucket, a rigid suspension for the bucket, means to mount the suspension in the buggy to swing, and devices to selectively rotate the bucket about a vertical axis.

ORE-TESTING TABLET.—No. 868,270; John E. Hunsinger, Saginaw, Mich., assignor to Earl A. Cheney and Frank Cheney, Saginaw, East Side, Michigan.



An ore-testing tablet, comprising powdered, hard-wood charcoal fifteen parts, chlorate of potash eight parts, sodium carbonate six parts, said ingredients being bound together by a suitable adhesive. An ore-testing tablet comprising a fuel, an agent rich in oxygen to enhance combustion, and a combustion retarding agent and flux.

FAN-VENTILATORS.—No. 868,206; James W. Miller, Gillespie, Illinois.



The combination in a fan for the purpose described, of two cone-shaped hub sections arranged with their large portions inward and adjacent to each other, an annular central disk fixed between and extending radially from the inner large portions of the hub sections, annular side rims, angle bars fixed to opposite sides of the central disk and having inner straight portions disposed radially to the centre of the fan and also having outer portions curved outward and rearward, with reference to the direction in which the fan is rotated, correspondingly arranged and shaped angle bars fixed to the inner sides of the side rims, and radial blade sections located at opposite sides of the central disk and fixed to the angle bars on the disk and side rims and having their outer end portions curved rearward, with reference to the direction in which the fan is rotated.

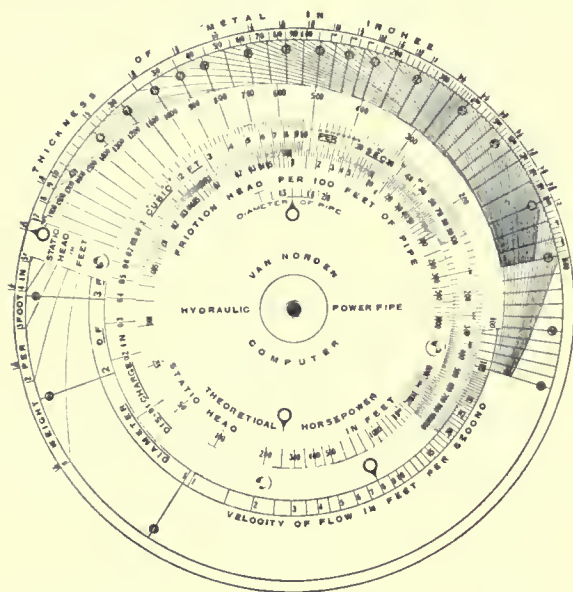
A Rapid Calculator.

The accompanying illustration shows a new device for the rapid calculation of the various functions and dimensions of hydraulic pipe-lines. It was designed by Rudolph W. Van Norden, of San Francisco.

There is probably more uncertainty as to the exact behavior of water, with the accompanying losses by friction, change in velocity, direction, etc., than in any other branch of practical engineering, and many formulas have been worked out, none of them, however, fulfilling all the conditions required. The development of power for all purposes from high waterfalls, entailing great pressures, has enormously enlarged the use of riveted sheet iron and steel pipe, especially on the Pacific coast.

The formula on which the working of this computer is based was developed as the result of a large number of tests on pipes, varying greatly not only in the pressure applied but in size and length. It is accurate for all ordinary conditions.

There are two movable dials, a movable sector, and a stationary dial. With these, eight factors are determined, pro-



In the illustration the lines showing the different dials do not show distinctly owing to the fact that the dials are cut out of blank card stock and will not photograph readily. The window in the dial for theoretical horsepower does not show, but the general appearance of the device is well shown.

vided any two are known and one assumed. These factors are: Diameter; thickness of metal; weight per foot of length; static head; quantity of flow, in second-feet; friction head; velocity of flow; theoretical horsepower of the water.

The scale of flow, in cubic feet per second, is on the larger dial, 6 in. diam., arranged to coincide with that of the friction head, on the small dial, 5 in. diam., the latter being drawn to one-half the logarithmic unit dimension of the former. When the initial points of both scales are placed so as to coincide, the numbers on the lesser scale are the squares of the corresponding numbers on the other scale. Through a window in the small dial, under the friction head scale, is shown a scale of the diameter, drawn on the large dial. These three scales are proportioned so as to represent graphically the friction head formula used.

A scale showing the static head is also drawn on the small dial, and when placed in contact with the proper value on the flow scale shows the theoretical horsepower through a second window in the small dial (not shown in the cut), by a scale drawn on the large dial. This is a simple multiplication in the first power, arranged with a constant.

On the stationary dial, in contact with the scale of flow, is a second scale of the diameter and also one giving the velocity of flow, this last value varying directly as the flow and inversely as the square of the diameter.

On the outer circle of the stationary dial are two concentric scales, one showing the proper thickness of metal,

using a factor of safety of $4\frac{1}{2}$ and a tensile strength of 50,000 lb., and the other the weight per foot of the completed pipe at the thickness determined. The two scales are operated by a sector having a curved edge, based on the graphical representation of the static head, various values of which are also shown on a logarithmic scale. The contact, of a value of the static head, with one of diameter, determines the thickness. A series of curved lines, joining points of similar weight of the various sizes of pipe, terminates in a scale of weights; the curved line denoting the weight should be selected as the one coinciding with the intersection of the curved edge of the sector and diameter.

The scale of friction head is carried to 1,000 ft. to allow for calculations for the flow of water from pumps. The pressure required to force a given quantity of water through a given length and size of pipe can be instantly determined by finding the friction head for the total length and adding to it the static head on the pipe. This method does not, however, provide for sharp bends or entrance friction.

Long cast iron and wood-stave pipes may be calculated for flow, diameter, velocity, and friction head. In the former, however, the values of friction head, where the pipe has a diameter less than 16 in., are less than those given by the computer, or in other words, the quantity of flow for a given friction loss is greater. The proper constants are, however, tabulated so that the calculations for the smaller sizes may be made. The friction head of wood-stave pipe is from 50 to 70% of the values given, depending on whether the pipe be old or new, but the use of these constants for wood pipe will give results somewhat less than those derived by Kutter's formula, where n is taken as 0.010 for pipes from 12 in. up, and this difference increases as the diameter increases, until for 24 in. it amounts to 35% and for 48 in. to 50% of the higher value.

This method therefore computes the flow for large wood pipes greater than that determined by the Kutter formula method for a given friction loss.

A page of directions accompanies the instrument, clearly showing the various operations, and with a little practice the operation will be found to be as simple and as accurate as the slide rule. The calculator is bound in a neat board cover. The dials are made of the best quality of bristol board, reinforced on the back with muslin, while the surface is finished with a waterproof varnish, which can be washed if soiled.

In the accompanying cut the computer is set to work the following problem: Given a flow of 11 cu. ft. per sec., head of 500 ft., and assume a diameter of 16 inches.

The line showing 500 ft. on the sector is placed to coincide with that showing a diameter of 16 in. on the stationary dial. The large dial is then revolved so that the number 11 on the flow scale will also coincide. Place the pointer for diameter at the window in the small dial at 16 in. of the second diameter scale. In contact with the line of flow, head, and diameter is the friction head, which in this case is 1.6 ft. per 100 ft. of pipe. The pointer at the lower side of the large dial shows the velocity of flow, which is 8 ft. per second. The pointer on the sector gives the thickness of metal, which is $\frac{5}{32}$ in. Following out the curved line which coincides with the intersection of the diameter line and the edge of the sector, gives the weight per foot of the finished pipe as 30 pounds.

To get the theoretical horsepower in the water, the small dial must be revolved until the number in the second, head in feet scale, which in this case is 500, coincides with the number 11 in the flow scale. Through the second window in the small dial may then be read the answer, 640 horsepower.

It will be readily seen that any other two quantities might have been the given ones and that any third quantity may be assumed.

THE RISDON IRON WORKS has completed the shipment of an order of 70 Risdon-Johnston concentrators to the Moctezuma Copper Co., at Nacozari, Sonora, Mexico. This order constitutes the entire vanner equipment of the new 1,200-ton mill now building by the Moctezuma Co., and was secured as the result of a long competitive test.

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TABLE OF CONTENTS

Editorial:	Page.
Notes.....	597
Wall Street.....	598
Mining Location by Deputy Mineral Surveyor.....	599
By the Way.....	600
General Mining News.....	602
Special Correspondence.....	607
Mexico City.....	
Butte, Montana.....	
Johannesburg, Transvaal.....	
Salt Lake, Utah.....	
Wallace, Idaho.....	
Leadville, Colorado.....	
Concentrates.....	612
Discussion:	
Grass Roots.....	Ingeniero 613
The Barnes King Affair.....	R. B. Lamb 613
Greek Gifts.....	A Believer in Free Gifts 614
Professional Customs.....	Percy L. Fearn 614
.....	Charleton, Dickinson & Co. 614
The Wild-Cats of Ontario.....	D. A. 615
Articles:	
Mining in Australasia.....	H. L. Wilkinson 616
A Make-Shift Stamp-Mill.....	619
Weight of Water per Cubic Foot.....	C. D. Demond 620
Economy of Power in Crushing Ore.....	Ernest A. Hersam 621
.....	621
Testing a Water-Gate.....	628
Mining and Metallurgical Patents.....	627
The Prospector.....	619
Departments:	
Personal.....	601
Market Report.....	601
Obituary.....	601
Commercial Paragraphs.....	628
Catalogues Received.....	628

Editorial.

ON ACCOUNT OF the peculiar financial conditions and the consequent series of legal holidays, it has been deemed advisable to postpone the convention of the California Miners' Association, announced for November 25. The date of meeting will be stated a few weeks hence when the executive committee considers the conditions more favorable to a good attendance.

FURTHER LETTERS in reply to the questions involving professional customs appear in this issue. One of the letters is from a representative firm of mining engineers in England. We expect to publish several more contributions on the same subject, for it has evidently aroused keen interest. When the replies have all appeared, it will be time enough to offer further comment.

WE TAKE PLEASURE in giving our readers a scholarly article by Mr. Ernest A. Hersam, professor of metallurgy in the University of California. The economy of power in crushing ore is important to all managers of mills and smelters, and we expect that the discussion of the fundamental problems underlying so practical a matter will commend itself to engineers.

THE TEST to which the Trust Company of America was subjected during the recent panic at New York affords a striking commentary on financial conditions. In the course of two weeks this banking institution paid out no less than \$31,000,000 to its frightened depositors. This run is unprecedented in the history of banking and ought to establish the Trust Company of America securely in the confidence of the public.

THREE OF THE TRUSTEES of the State Mining Bureau have resigned, namely, Curtis H. Lindley, F. W. Bradley, and E. A. Stent. Only two—Louis Janin and Harold T. Power—remain. The resignations are due to the fact that the trustees find themselves in a false position, being used chiefly as an auditing committee to pass upon expenditures over which they have no control.

CONGRESS is to be asked to release the miner from the legal necessity for doing assessment work on his claim, so that the expenditure of \$100 in work may be avoided. It is stated that this will "relieve the miners and prospectors of a great burden at a time when such relief will be most appreciated." We question the advisability of this step. While, of course, desirous of supporting any act likely to benefit the miner or the community in which he lives, we regard this suggestion concerning assessment work as mainly in the interest of

questionable mining companies that have acquired control of a large number of unpatented claims on which the proper work of mining has not been done. The real miner and prospector has done his assessment work by this time, and, if he has not, the financial stringency will not deter him, for his credit is unimpaired. On the other hand, there are wild-cat companies and speculators that have sold stocks and interests in unpatented claims, never intending to do any work but hoping to make a turn before the annual requirement became due. Such people will suffer, and if they do not, the public will, assuredly. The congressmen and newspapers that advocate this abrogation of assessment work are playing to the gallery.

ON ANOTHER PAGE will be found a statement made by Mr. R. B. Lamb, explaining his connection with the Barnes King Development Company, which came to grief recently. It appears to be another case of an engineer's advice being set aside because it interfered with the plans of promoters. The members of our profession will be glad to absolve Mr. Lamb of all blame. If there be a lesson to be drawn from the episode, it is to resign from the service of a client that disregards the advice he pays you to give him. People that run counter to their consulting engineer's advice are either knaves or fools, usually the former.

IN the London *Mining Journal* just to hand we note a long letter from Mr. James Darroch referring to charges of gross plagiarism brought against him in that journal by Mr. L. Parry. One of the charges concerns an article sent to us by Mr. Darroch and appearing in our issue of January 19. Into the merits of the controversy we do not care to go, but we note that Mr. Darroch insists that "reputable papers do not publish personal attacks, and it is their usual custom to send the person assailed a copy of any criticism received, so that he may reply to it in the same issue." To this the editor of the *Mining Journal* replies, saying that such a statement "only requires formulating for its absurdity to be apparent." Mr. Darroch is right and the editor at London is wrong—absolutely and completely. As an instance in point we remember that in 1895 Mr. E. J. Dunn, now director of the Geological Survey of Victoria, was charged with having stolen the ideas of a Mr. Nicholas in regard to the geology of Bendigo and the attack appeared in the form of an anonymous letter published by the London *Mining Journal*. As Mr. Dunn probably would not see it and certainly could not reply to it under several months, I undertook to defend him, knowing him and Bendigo intimately. Mr. Dunn's present position and reputation refute the calumny, but a younger and less known man might have suffered severely from the imputation. Certainly any reputable journal should—and usually does—permit a man whose character is assailed to reply to the accusation in the same issue as the one containing the attack. The very fact that mining engineers are so nomadic that they may not be able to protect their honor when thus assailed is the more reason for going slowly in such matters.

Wall Street.

THE FINANCIAL NERVE-CENTRE of this continent is situated on a narrow street running from lower Broadway to the estuary separating New York from Brooklyn. As a symbol of the speculation underlying the larger part of modern industry, Wall Street has become the expression of relentless materialism and selfish greed, until to many well-meaning people it is a complex of Monte Carlo and the pawnshop, of the highway and the arena, of the devil and the deep sea. Away from New York, on the farms of Nebraska or among the mines of Colorado, this Wall Street is spoken of as something utterly wicked and hopelessly unregenerate. Populist orators may be responsible for such a slander, but there are reasons less superficial. Certain it is that no one is more surprised at the unfriendly opinions of such provincials than is the banker or broker whose whole soul is in the great game that is played where Nassau, Broad, and Wall streets come together—the ganglion of a tense nervous system whose twitchings convulse the markets of this continent from New York to San Francisco, from Montreal to the city of Mexico.

Let us analyze this prejudice against Wall Street. Is it merely the expression of ignorance or due to a jealousy of those that pull the strings? Is it only the sneer of the disgruntled or the vaporings of a discontented mind? We think not. To us there is a basic reason for the attitude assumed by the majority of people in the West in regarding Wall Street as the epitome of sinister speculative activity. We share it ourselves; for the following reasons:

Wall Street absorbs too much of the productive energy of the country. Thus, take a community like Denver or Salt Lake: There you have a population of, say, 100,000 to 200,000 and the distributing centre for a mineral and agricultural region of varied resources. Among the citizens there are a number of men distinguished for wealth and initiative. If a new goldfield is discovered there are always a few such men able and willing to buy the prospects and make them mines, by spending money in exploration and equipment. If an agricultural experiment is to be made, by irrigation or the cultivation of a new product, such men are ready to take the risk of starting the fresh enterprise. If branch railroads are required, they supply the capital; if public utilities need to be financed, they come forward. We speak of the kind of man that is responsible for the industrial development of America, real captains of industry, not *chevaliers d'industrie*, but men of marked originality, broad imagination, and invincible courage, those that *do* things. This type of man means much to a people engaged upon the industrial conquest of a continent. But this is the kind of man that Wall Street entices, engulfs, and spues out—broken and worthless. For, finding that money can be made faster and more easily by buying mining stocks than by developing mines, such men cease to devote themselves to the creative side of industry and become mere gamblers; they leave the West and stay at the Waldorf. Other men, who built railroads and were

discovered to have unusual executive ability in the administration of a great system of transport, also abandon the career in which they were of such obvious usefulness in order to speculate in railroad stocks; they no longer build railroads, they help to wreck the companies controlling them; at the best they end in ruining themselves, if not financially, at least as productive members of the community. It is not necessary to expand the theme by referring to other examples of misdirected energy. The general result is that a distressingly large proportion of the pioneer type of man, the men that blaze the trail of industry and lead the way in every sort of beneficent endeavor, are taken away, to become essentially unproductive speculators. From the provincial town they go to the financial centre, from the factory to the hotel, from the mine to the bucket-shop. In short, Wall Street absorbs too many of the dynamic men of America.

We venture to say that the brains and ability wasted upon betting on stocks on Wall Street would more than suffice to run the continent of Europe and administer successfully the political and financial affairs of every monarchy and republic from the Ural mountains to the Irish sea. Of course, speculation in stocks is considered a finer occupation than betting on the red and black, but it is no more productive of tangible results, and, for ourselves, we think it nowise different, save for the larger issues involved. Every hamlet in the mountains, every town on the plains, sends a few of its shrewdest, most energetic, and most forceful—its dynamic—men to Wall Street every year. They are as lost to productive industry as if they were swallowed in a maelstrom. Of course, we know that they originate schemes, they underwrite the finances of fresh undertakings, they set going new enterprises that create prosperity for all of us—so says the apologist. But, having lived in New York and stood on the edge of the crater, we are little inclined to accept such an explanation of the bubbling and the turmoil, the fume and the steam, that issue daily from the depths, making the earth tremble and the blue sky alternately black with gloom or bright with the flashes reflected from the cauldron below. Middlemen we must have, promoters too, and brokers; that is well enough, but we are protesting against turning natural pioneers into middlemen, leaders into besotted followers, engineers into stock-jobbers. Think of the stimulus to industrial progress, possibly even to something higher, if about two-thirds of the brilliant and intensely forceful men now congregating on Wall Street were released from the menagerie of bulls and bears to return to the mines and farms, the railroads, and the factories of this country, to give to it once more the native intelligence and the uncommon ability that is now devoted to a financial catch-as-catch-can. When a strong skillful miner quits work to play faro or roulette, we call him vicious, we regret the loss of a fine workman, we note the degradation of a good citizen. The camp needs such men to develop its mines, and the town will suffer by the diversion of such a unit of energy into an unproductive channel. A useful man has become a useless gambler. The

reasonableness of such a view of the matter may not be obvious to everyone, but such is the mental attitude of the West to Wall Street.

Mining Location by Deputy Mineral Surveyor.

ON SEVERAL OCCASIONS in response to inquiries from subscribers, we have attempted to give in these columns the then state of decision as to the right of a deputy mineral surveyor to make a mining location. It had been there noted that the Land Department had changed its rulings frequently and that the question seemed to be still subject to debate so far as departmental decisions were concerned. As to the State courts, the Supreme Court of Utah had held that a mining location made by such deputy was void from its inception and no title could be obtained through it by a third person. It was also observed that the Supreme Court of the United States, having the opportunity to pass upon the question, neglected to do so, leaving it practically unsettled. The other Federal courts have not as yet spoken. We have now to note two additional contributions to the literature of the law, one by the Secretary of the Interior and one by the Supreme Court of the State of Nevada. These may be briefly outlined.

Sigmund K. Bradford, a deputy mineral surveyor for Nevada, located certain placer claims near Tonopah. His action was reported to the Commissioner of the General Land Office by a special agent, and, after hearing, an order was entered by the Commissioner directing the revocation of his appointment as deputy. On appeal to the Secretary of the Interior the revocation was upheld on the ground that the law inhibited locations by deputy mineral surveyors, and that, in making the location in question, Bradford was guilty of a violation of the law and incurred the penalty of dismissal. The validity of the location was not directly passed upon, although the inference is obvious that if it had been before the department for adjudication, it would have been held to be invalid.

The Supreme Court of Nevada in the case of *Cook v. Hand*, in a majority opinion recently filed (Judge Talbot dissenting), reached a conclusion diametrically opposed to the ruling in the Utah case and to the conclusion reached by the Secretary of the Interior in the Bradford case (although the Court had no knowledge of the Secretary's ruling in the latter case). The Nevada court holds that deputy mineral surveyors are not disqualified from making mineral locations and that such locations, when made, are valid. The processes of reasoning by which the divergent conclusions are reached are interesting only to the lawyer and metaphysician. Courts of other jurisdictions, in passing upon the same question, have their choice of precedents. Until the Supreme Court of the United States speaks on the subject deputy mineral surveyors will undoubtedly refrain from making locations; otherwise they will lose their appointments. The rule in the Bradford case will unquestionably be enforced by the Secretary of the Interior against all deputies who attempt to make locations.

By the Way.

Owing to the record established by the *Lusitania*, which crossed the Atlantic in 4 days 20 hours and made 617 knots or 740 miles in one day, the following account of this vessel, from *Engineering*, will be of interest:

The *Lusitania* is a most encouraging success. It is not so much that her preliminary trials promise the realization of the contract condition that she shall make a double voyage on the Atlantic between Liverpool and New York at an average speed of 24½ knots within a year of her entering the service—this is gratifying in the highest degree—but the success carries a greater significance. Although the vessel certainly marks progress in marine construction, she must, further, be regarded as a pioneer—as beginning a new era. This is because of the adoption and success on a huge scale of the steam-turbine as a ship-propelling engine. Other vessels, it is true, are now run by turbine-driven screws; but when the system was decided upon for the *Lusitania*, the experience with this type of engine on a large scale was limited, and particularly so as regards durability. The confidence of the owners and builders of this ship, now justified, gives promise that the future will see greater developments. We find that each successive generation has had at command almost equal mental activity and mechanical ingenuity, with the important addition, that lapse of time brings accumulated experience, to enable higher results to be achieved. The problems are now greater, if more clearly defined by reason of our more exact scientific knowledge; but the encouragement afforded by past successes is also greater; and thus there is no reason to suppose that the *Lusitania* will be other than a stimulant to greater effort to surmount new difficulties and sweep away new obstacles which beset the path of progress in the most fascinating of all branches of applied mechanics—the rapid, comfortable, and safe transportation of passengers across the seas, often turbulent and ever resistant, which separate the increasingly friendly nations of different continents.

DIMENSIONS AND GENERAL DATA.

Length over all.....	785 ft.
Length between perpendiculars.....	760 ft.
Breadth, molded.....	88 ft.
Depth, molded.....	60 ft. 4½ in.
Gross tonnage.....	32,500
Draught.....	33 ft. 6 in.
Displacement.....	38,000 tons
Number of passengers—first.....	552
second.....	460
third.....	1,186
Type of engine.....	Parsons turbine
Number and type of boilers.....	25 cylindrical
Number of furnaces.....	192
Steam pressure.....	195 lb.
Total heating surface.....	158,350 sq. ft.
Total grate area.....	4,018 sq. ft.
Total indicated horsepower.....	68,000
Speed.....	25 knots
Coal for voyage to New York.....	5,000 tons
Cargo carried.....	1,500 tons
Coal per i. hp. per hour.....	1.45 lb.

One important feature in fixing the designs had reference to the use of the ships as cruisers or scouts in time of war, and the machinery—which is almost entirely under the water-line—has been so disposed in separate compartments, and with coal protection along each side, as to counteract, as far as possible, the effect of the enemy's fire at the water-line. For purposes of attack the *Lusitania* will be provided with an armament as satisfactory as the armored cruisers of the County class, because on one of the topmost decks there will be carried, within the shelter of the heavy shell-plating, four 6-in. quick-firing guns attaining a muzzle energy of over 5,000-ft. tons, while on the promenade-deck on each side there will be four more guns on central pivot mountings,

also able to penetrate 4½-in. armor at 5,000 yards range, and 6-in. armor at 3,000 yards range. With the great speed, which can be maintained for three or four times the period that any modern cruiser can steam even at only 21 knots, and with the careful subdivision for protection and their satisfactory offensive power, the *Lusitania* and her consort may be regarded as most effective additions to any fighting squadron.

The rudder and steering-gear are all placed well below the water-line. This is a most important point in respect of protection, should these vessels be ever impressed into the national service. The stern has been suitably shaped in the *Lusitania* to enable this object to be accomplished satisfactorily.

The adoption of four units of machinery and four screw-propellers enabled the machinery to be made in two completely separate sets, one to starboard and the other to port, just as in a vessel with twin-screw reciprocating machinery; a distinct advance upon the triple-screw arrangement in former turbine ships, where such complete independence is unattainable. The division of the power into two complete and independent systems follows the course pursued for so many years in the Royal Navy, whose lead is now so generally adopted in this respect in the mercantile marine. It has in this case enabled the engine-rooms to be well subdivided by watertight bulkheads, and the advantages in general secured have been obtained without the sacrifice of a single point of any importance.

In the form of stern devised to improve the manœuvring, the dead wood was cut away. As in earlier Clydebank ships, the rudder, of the barn-door type, is supported for about two-thirds of its depth. Immediately forward of it, on each side, are the two inner propellers, the shafting for these being entirely borne within the ship, the framing of which was bossed out, and strongly supported by heavy webbing. The forward propellers are about 70 ft. ahead of the inside screws, and here also the frames are carried by heavy webs. Owing to the great beam of the ship, and the very fine run, the blades of the outside propellers do not project beyond the beam-line, while, at the same time, all the propellers work in free water, and provision has been made for a satisfactory clearance between the propellers and the skin of the ship. The calculations of stresses were carried out in the usual way, on the assumption that the material of the hull, if built of mild steel, should not be subjected to a stress exceeding 10 tons per sq. in., and on the basis that the vessel might experience the hogging and sagging stresses consequent on meeting with waves of her own length, and of a height from the trough to crest of one-twentieth of the length of the wave. The very careful series of calculations entered into showed that the maximum bending moment was slightly over 1,000,000 ft.-tons.

COMPARATIVE TABLE OF OCEAN LINERS.

Name.	Date.	Length, ft.	Displacement, tons.	1. hp. of engines.	Speed, knots.
Great Eastern.....	1858	680	27,000	7,650	14
Britannia.....	1874	455	8,500	5,500	15
Umbria.....	1885	500	10,500	14,300	18
Campania.....	1893	600	18,000	30,000	20
Kaiser Wilhelm der Grosse.....	1899	625	20,800	30,000	22
Deutschland.....	1900	662	23,600	36,000	23
Kaiser Wilhelm II.....	1903	678	26,000	38,000	23½
Adriatic.....	1907	725	28,000	40,000	23
Lusitania.....	1907	785	45,000	68,000	25

The *Lusitania* affords accommodation for 540 first-class, 460 second-class, and 1,200 third-class passengers. There are 717 rooms. Elevators are provided. There are eleven of these, all worked by the electric current supplied by the ship's generating plant. They travel through a height of 36 ft. between decks.

Personal.

ARTHUR L. PEARSE is here.

POPE YCATMAN is at Ely, Nevada.

F. P. KENNEDY is at Treadwell, Alaska.

JOHN B. FARISH has returned to Denver.

E. GYBON SPILSBURY is at Guanajuato.

ALBERT BURCH has returned from Grass Valley.

ALFRED JAMES is at El Paso, on his way to Mexico.

HARTWIG A. COHEN was at Nevada City during the past week.

C. E. BOGARDUS, of Seattle, was in San Francisco this week.

WM. H. SPAULDING is here on a visit from Rhyolite, Nevada.

J. H. CURLE writes from Ceylon, on his way to Mandalay.

J. GORDON HARDY is returning to El Paso from San Francisco.

CHARLES H. LYSER has returned to San Francisco from Costa Rica.

J. POWER HUTCHINS has been examining dredging ground in eastern Oregon.

ELY HUTCHINSON is attending the session of the American Mining Congress at Joplin.

ARTHUR L. PEARSE was here on his return from Alaska, and is now at Phoenix, Arizona.

H. R. PLATE has been appointed manager for the Consolidated Copper Co., at Ely, Nevada.

E. M. RAY, consulting engineer for T. N. Barnsdall, of Pittsburg, was in Chihuahua last week.

JOHN F. ALLAN has been appointed general manager for the Caucasus Copper Co. in Asia Minor.

H. S. ALLEN is assayer with the Bagdad-Chase Gold Mining Co., at Soulsbyville, California.

ROBERT WISNOM, mill superintendent for Chas. Butters & Co. at Virginia City, is in San Francisco.

WALTER G. GEDDES has been appointed general manager for the Daisy Mining Syndicate in Nevada.

J. A. HARTLEY is at work in the Garvin Cyanide & Development Co.'s laboratories at Los Angeles.

NOEL BARNER broke his leg in an accident underground at El Oro, Mexico. He is recovering satisfactorily.

PHILIP R. BRADLEY is here on a holiday from British Guiana, where he is superintendent of the Peters gold mine.

JAMES D. STEWART, superintendent of the United Water & Power Co., is on a visit to San Francisco from Gold Run.

H. P. GARTHWAITE, resident director of Butters Salvador Mines and Butters Divisadero Co., has arrived in New York.

B. L. FARRAR, formerly of Colorado, is superintendent of the Chihuahua Mining Co. at Santa Eulalia, Chihuahua, Mexico.

OTTO STAHLMANN, of Salt Lake, formerly connected with the Anaconda Copper Co., is general manager for the Canadian Smelting & Refining Co. at Sault Ste. Marie, Ontario.

Obituary.

CLERMONT LIVINGSTON, general manager for the Tyee Copper Co., died on October 20 at his home on the Koksilah river, on Vancouver Island, B. C. He succumbed to bronchial pneumonia after a week's illness. He was born at London in 1850. Fifteen years ago he organized the company that purchased the Tyee mine, and became the moving spirit of that copper mining enterprise. He is survived by his wife, three sons, and two daughters, one of whom is the wife of E. C. Musgrave. In British Columbia Mr. Livingston was highly respected, as an honorable and capable manager, a man of sound judgment and fair in all his dealings. His sudden death will be mourned by many, both in Canada and England.

Latest Market Reports.

LOCAL METAL PRICES—NOV. 14.

Antimony.....	13@17c	Quicksilver (flask).....	\$45.50
Copper scrap.....	16@17c	Spelter.....	7@ 7.75c
Pig Lead.....	4.85@ 5.80c	Tin.....	39½@41c

ANGLO-AMERICAN SHARES.

Cabled from London.

	Nov. 6.	Nov. 13.
£. s. d.	£. s. d.	£. s. d.
Camp Bird.....	0 17 3	0 17 0
El Oro.....	1 1 3	1 1 3
Esperanza.....	1 12 6	1 11 3
Dolores.....	1 0 0	1 0 0
Oroville Dredging.....	0 14 0	0 14 4½
Stratton's Independence.....	0 2 9	0 2 9
Tomboy.....	1 6 3	1 7 6

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.

Date	Electrolytic Copper	Lead	Spelter	Silver
Nov. 8.....	137½	4.47	5.10	58½
" 9.....	137½	4.47	5.08	58½
" 10.....	Sunday. No market.			
" 11.....	137½	4.47	5.05	58½
" 12.....	137½	4.47	5.03	58½
" 13.....	137½	4.47	5.05	58½
" 14.....	137½	4.47	5.05	58½

COPPER SHARES—BOSTON.

	Closing prices. Nov. 14.		Closing prices. Nov. 14.
Adventure.....	87½	Michigan.....	8
Ahmeek.....	46¼	Mohawk.....	44
Allouez.....	22	Nevada Con.....	71½
Amalgamated.....	46¼	North Butte.....	36½
Arcadian.....	3	Old Dominion.....	22
Atlante.....	8½	Osceola.....	79
Balaklala.....	3½	Parrot.....	9
Bingham Con.....	5	Phoenix.....	...
Boston Con.....	9½	Quincy.....	77
Butte Coalition.....	13¼	Raven.....	75
Calumet & Arizona.....	97½	Rhode Island.....	21½
Calumet & Hecla.....	580	Santa Fe.....	17½
Centennial.....	18	Shannon.....	95½
Con. Mercur.....	25	Superior & Pittsburg.....	9
Copper Range.....	50¼	Tamarack.....	57
Daly-West.....	10¼	Trinity.....	101½
Franklin.....	7	United Copper com.....	8
Granby.....	75	Utah Copper.....	15
Greene-Canaan, etc.....	5¼	Victoria.....	41
Isle Royale.....	14½	Winona.....	3
Mass.....	21	Wolverine.....	100

MINING STOCK QUOTATIONS—NEW YORK.

	Closing Prices. Nov. 6.	Nov. 13.
Bingham Central.....	7½	3½
Boston Copper.....	12½	10
Cumberland Ely.....	5½	5½
Dolores.....	5½	5
El Rayo.....	21½	21½
Giloux Con.....	3½	3
Greene Cananea.....	5¼	5¼
Nevada Con.....	71½	71½
Nipissing.....	61½	57½
Tennessee Copper.....	24	25
Tonopah Ex.....	11¼	1
Tonopah-Belmont.....	11¼	1
Tonopah.....	71¼	81¼
United Copper.....	81¼	8
Utah Copper.....	171½	16

(By courtesy of Hayden, Stone & Co., 25 Broad St., New York.)

SOUTHERN NEVADA STOCKS.

San Francisco, Nov. 11

Atlanta.....	\$ 22	Laguna.....	75
Belmont.....	87	Manhattan Con.....	30
Columbia Mtn.....	18	Midway.....	45
Combination Fraction.....	88	Mizpah Extension.....	5
Daly.....	70	Mohawk.....	9.00
Fairview Eagle.....	6	Montana Tonopah.....	1.10
Florence.....	2.52	Nevada Hills.....	4.00
Gold Bar (Bullfrog).....	34	Red Top.....	...
Goldfield Con.....	3.95	Sandstorm.....	20
Goldfield of Nevada.....	1.00	Silver Pick.....	24
Gold Kewanna.....	23	St. Ives.....	37
Great Bend.....	27	Tonopah Extension.....	88
Jim Butler.....	45	Tonopah of Nevada.....	8.00
Jumbo.....	...	Tramp Con.....	18
Jumbo Extension.....	64	West End.....	36

(By courtesy of W. C. Ralston, 368 Bush St.)

General Mining News.

ALASKA.

W. R. Rust, president of the Tacoma Smelting Co., was elected president of the Northwestern Commercial Co. to succeed John Rosene. Among other companies controlled by this company are the Northwestern Steamship Co., which runs steamers between Tacoma and Alaskan ports, the Northwestern Development Co., which owns and is developing mining properties near Copper river and Katala, the Copper River & Northwestern Railroad Co., which is building a line from Katala to Valdez, via Copper Center, and the Northwestern Siberian Co., which holds concessions from the Russian Government for mining properties in Siberia.

ARIZONA.

COCHISE COUNTY.

The Copper Queen Consolidated M. Co., through its manager, Walter Douglas, has announced that beginning Nov. 10 the wages will be reduced to the scale prevailing prior to Nov. 7, 1906, when the wages were raised 50c. per day.—Byron M. Pattison, superintendent of both the Shattuck and the Denn mine, has announced that these mines will shut down. The Shattuck-Arizona shipped ore to the Copper Queen smelter at Douglas prior to the slump in copper; when the Copper Queen Co. closed down two of its furnaces, it refused to receive any more ore from the Shattuck; then the Shattuck shipped its sulphide ore to the Old Dominion smelter at Globe while the oxidized ore was held at the mine. Two weeks ago the Old Dominion smelter refused to receive more ore. As the Shattuck has much development done and much ore blocked out the company decided to close down instead of doing more development work.—The Copper Queen and the Calumet & Arizona continue to work full-handed; most of the men are working on development, as this had fallen far behind during the past year owing to the scarcity of labor during prosperous times and the necessity of putting most of the men to work in the stopes. Besides these companies were rather short of miners when the strike was first declared by the Western Federation of Miners.—A shaft is being sunk on the Badger claim near Paradise; this shaft, which is now 50 ft. deep, is being sunk in the limestone near the porphyry intrusion.—The drift on the vein driven from the adit at the Smith's Springs property, which is a short distance southeast of the Badger shaft, is still in good ore. This drift is now 60 ft. long. Much water is flowing from this drift.—At the Savage property more miners were put to work last week. The Snowball shaft is still in good ore; development has been begun by this company on the Little Eva claim which adjoins the Snowball on the northwest.

GILA COUNTY.

Wages were reduced by the Old Dominion Copper Mining & Smelting Co. to the schedule in effect prior to Nov. 7, 1906. This reduction became effective Nov. 5. At present the Old Dominion is working only five days a week.—A rich vein of copper ore has been found on the 210-ft. level of the Independence mine, on upper Pinto creek. This vein is 2 ft. wide and carries about \$8 in gold and silver besides the copper. A 4-ft. vein of concentrating ore has been found on this level. The shaft is being sunk deeper. This property is near the Cole & Goodwin property and about four miles from the Gibson mine, where a strike of good copper ore was made some time ago.

GRAHAM COUNTY.

All the mining companies in the Clifton-Morenci district adopted a new wage scale on Nov. 1. As yet the wages of the machinists, blacksmiths, and boiler-makers have not been reduced. Most of the carpenters, whose wages were reduced 32c. per day, have quit work. The miners and millmen have accepted the reduction.—The wages of the miners at the Arizona Copper Co. properties have been cut 25c. per day. Concentrator No. 5 at Morenci has been shut down and 300 men at the mine and reduction works have been laid off on this account. The No. 6, or Long-

fellow, concentrator is running with a full force. The cut in the millmen's wages was 25c. and 50c. per day. The reduction of wages at the smelter was practically the same.—Similar cuts were made by the Shannon Copper Co. The output of the Shannon smelter for October was 1,536,000 lb. of blister copper. The new 1,000-ton furnace is working finely and is smelting at full capacity.—The output of the Arizona Copper Co. for October was 2,876,000 lb. of blister copper.—There has been no laying off of miners at the property of the Gold Belt D. & R. Co. The shaft, which develops the copper orebody, is now 200 ft. deep. The shaft, developing the gold-bearing vein, is also 200 ft. deep. Driving is being done on the 100-ft. and the 200-ft. level from this shaft. Sufficient water has been cut in this shaft to supply a good-sized mill and the company is rejoicing over the fact.

PIMA COUNTY.

The Twin Buttes has shut down and only the pump is kept running. The mine is said to be looking well and the shut-down is due to the slump in copper. The Calumet & Arizona people are still working on their property near the Twin Buttes. The Mineral Hill Consolidated has shut down as has also the Paymaster.—The force of miners at the Old Pueblo mine has been increased and much development work is being done at the mine. High-grade ore has been cut in the new shaft started on the Quien Sabe. This shaft is 25 ft. deep at present. A new road has been built from Tucson to this mine. The company intends soon to begin regular shipments to the smelter.

PINAL COUNTY.

The main shaft at the property of the Calumet-Pinal M. Co., at Owl's Head, 16 miles north of Red Rock, is 165 ft. deep. The drift on the 130-ft. level is in ore. Only a small force of miners has been working at the property since the slump in copper.

CALIFORNIA.

BUTTE COUNTY.

About seven miles southeast of Buck's ranch August Benner and H. G. Greenbower are driving an adit into Mount Arratt ridge on the slope facing the Middle Fork of Feather river. This adit is 250 ft. long; in a raise made at that point gravel was struck at a height of 10 ft., but, as it does not carry enough gold to pay for working, they are going to drive the adit farther in order to catch the deep channel.—Development work is being pushed at the Blue Lead mine where 10 men are working. This property is being developed by the Selbys of the Selby Smelting Co. A drainage adit is to be driven from the Kentucky ranch to cut the channel and so save the large expense due to pumping.

KERN COUNTY.

The Yellow Aster mill is treating about 500 tons of ore per day.—Considerable leasing is being done at the mines near Randsburg.—At the old Pathfinder group of claims on Fremont Peak, 15 miles from Randsburg, four men are working. These mines were re-located by B. F. Race some time ago, and are now called the Newlands group. H. C. Register, of Los Angeles, has bought a two-third interest and is developing this property. Some good ore has been struck in the new shaft that is being sunk.—Owing to the present financial stringency on the first of the month the tungsten mine at Atolia was closed. About 12 of the miners who have families at the property will be kept working at the property during November.

NEVADA COUNTY.

Good ore has been found at the mine of the Bear River Consolidated Tunnel Co., this vein is 6 ft. wide and the ore is a sulphide with some free gold. This company owns property on both sides of Bear river. The adit on the north bank is 256 ft. long. This company is composed mainly of local people.—The management of the Gold Mound property on Deadman's Flat intends to sink the shaft to a depth of 400 ft. At present the shaft is 165 ft. deep. Levels will be run at 200 ft. and 400 ft., but none at 300 ft. The vein in the Gold Mound mine has widened to 7 ft.; the walls of the vein are well defined. The ore carries some free gold.—The Belle Union M. Co. has started to drive a new adit to

develop the vein at greater depth. This adit should reach the lode within 200 ft. A winze will then be sunk on the vein.—The recent decision in the Pine Hill-Rosenthal litigation leads many to think that a compromise will be effected soon and that the Pine Hill mine will be working full force again by spring. The adit has been recently re-timbered and many improvements have been made this summer but, on account of the litigation, the new hoist which is at the mine has not been installed as yet. The ore at this mine is copper carrying gold and silver.

PLACER COUNTY.

At the meeting of the shareholders of the United Water & Power Co. of California, held in San Francisco Nov. 13, all shareholders being present, the following officers were elected: President, Arthur L. Pearse; vice-president, James L. Gould; secretary and treasurer, Chas. H. Town. These officers constitute the board of directors. The board of directors chose James D. Stewart general manager. It was also voted to issue 40,000 7% preferred non-cumulative shares. Nearly all these shares have been placed and the funds will be used in developing the company's mines near Gold Run in this county.

SHASTA COUNTY.

The Mammoth Copper Mining Co. is practically the mainstay of this county at present—at least as to mining; its monthly payroll amounts to about \$80,000. This com-

gauge steam railroad, then 3,000 ft. of gravity railway, which transfers to the steam-road below, the ore from the electric railway, two miles long, which carries the ore from the mine to the head of the gravity road. This construction has been necessitated owing to the inadequate capacity of the aerial tramway at present being used.

The electric smelter at Heroult is about ready to commence work; the output at first will be about 3 tons of ferro-silicon per day.—The second payment has been made by the Western Exploitation Co. on the Milkmaid mine, near French Gulch. The bond has 6 months longer to run. Twelve men are working at this mine. Edward Lewis is foreman. This company shipped 400 sacks of ore to the Selby smelter some time ago, and last week it shipped 400 sacks, and 300 sacks are at the depot ready for shipment. At present this company has to wait 30 days for payment from the smelter.

SIERRA COUNTY.

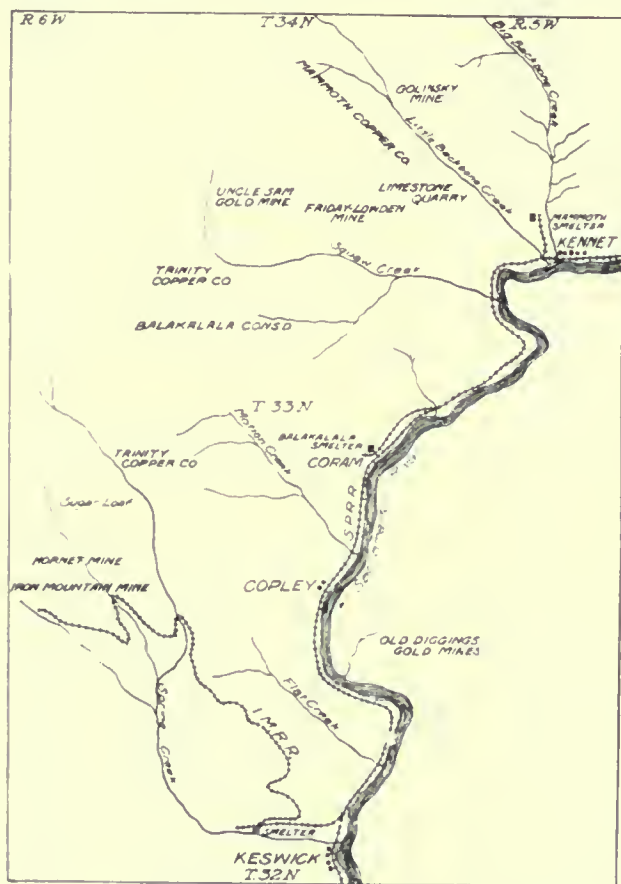
At the Telegraph drift mine an air-compressor is being installed to run the machine-drills in the shaft which is to be sunk to develop the quartz lode found in the property. The telephone line between the mine and Downieville is almost completed.—The 5-stamp mill at the Papoose mine in Jim Crow canyon is running at full capacity. Five more stamps are to be added shortly. The adit which is being driven to give greater depth on the vein is expected to cut the lode soon.—At the West Point drift mine, owned by Peekwith & Spaulding, near Monte Cristo, good pay-gravel is being mined. Much development work is being done so that many miners can be employed as soon as the winter rains begin.—The adit at the property of the Herkimer company is being driven ahead.—At the White Bear mine the raise, which is 267 ft. high, has cut into pipe-clay pitching into the mountain, indicating that the raise is too far west and is in the rim rock. A drift has been started from the raise at a point 60 ft. below where it cut the rim rock. It is hoped that this will be sufficiently deep to be below the channel. The Costa company owns $1\frac{1}{2}$ miles along the supposed course of this ancient channel.—At the Wilson & Tyre mine, on Galloway hill, a dumping and washing house is being built.

W. H. Griffith of Denver has bought the Cleveland quartz mine near Sierra city; an 18-stamp mill is on this property. Work at the mine will soon be resumed.—The new mill at the Keystone mine is almost completed. Wm. and Fred Perryman, Thos. Botling, and Claus Hansen have taken a lease on the mine.—The motors and other electrical apparatus to drive the air-compressor at the Telegraph mine have arrived and will be installed immediately.

TRINITY COUNTY.

At the Union Hill mine, near Lewiston, 30 men are at work enlarging the tunnel, which is to take the tailing from this hydraulic mine to Trinity river, instead of letting them go into Weaver creek, as at present. It will take three or four months to complete this work.—The Trinity River M. Co. has laid off the night shift at the tunnel, which it is driving about $\frac{1}{2}$ miles above Lewiston. Five men are working on day shift. This tunnel, which will be 1,300 ft. long, is about half completed; it is being driven to divert Trinity river from its present channel.—Work will soon commence at the Red Hill hydraulic mine on Trinity river. Gerald O'Shea and Japhet Lindeberg have bought the water-rights from the Huertevant estate, and this water will be used in operating this hydraulic mine.—It is reported that Ed Paulsen and Jack Leas, who are leasing in the Brown Bear mine near Deadwood, have found rich ore in ground between the China and the Watt adits.

At the Mountain Boomer mine, in the New River district, a 16-in. streak of good ore has been found in the lower tunnel. Wm. Montgomery, who is working the mine under a bond and lease, has 15 men doing general development work. Some good ore has also been found in the upper levels. The mill will be started soon.—The Utica and Buckeye group of mines has been bonded to Goldfield people by Larcine, Brown, and Williams. Work will be done on all these claims this winter.—It is expected that the Quimby mine, which has been closed for some time



Map of the Copper Region of Shasta County, California.

pany is still doing much construction work. The new stack, which is to serve seven furnaces, is now 70 ft. high and is being built at the rate of 7 ft. per day; its height when completed will be 200 ft. The old stack will then be used for the two converter stands now being installed so that the Mammoth company can make blister-copper. All the concrete work is finished, the machinery has arrived, and much of it has been already installed. On the line of the new railroad from the mine to the smelter, the hoist at the head of the gravity railway is being installed; the roadbed for the electric railway is completed, half of the track-laying is finished, and the trolley wire has been put up. This new transportation line from the Mammoth smelter to the mine is quite unique. From the smelter to the bottom of the gravity railway is three miles of standard-

owing to dissensions among the stockholders, will soon resume.—James Musick is putting in hydraulic machinery to work the gravel which he recently discovered just below the mouth of Eagle creek.—Brackett & James have made ready their placer mine below the mouth of Virgin creek for the winter run.

TUOLUMNE COUNTY.

Work has been suspended at the Jumper mine, and all the employees except a watchman and two engineers have been laid off. The main shaft is now 1,900 ft. deep; as the hoisting engine cannot raise ore from a greater depth, deeper mining is impossible until a new hoist is provided. John Evans, Dan Newman, Richard O'Brien, and James Tucker have taken a lease on the West vein and have commenced work.—George Stayton has sold to James M. McCurry an undivided one-twelfth interest in the Mother Lode mine near Jacksonville. The Joy Mining Co. has been organized in Santa Barbara to develop this property.—The Imperial mill has been finished and will be started as soon as the transformers are installed.

Work is progressing rapidly upon the Kanaka mill. Developments at the mine are quite satisfactory. Samuel Harris is manager.—It is expected that the Nonpareil mill will be completed by Dec. 1.—A full force of miners is working at the Mack mine, belonging to the Big Casino M. Co., and the mill is being run full time.—A new change-house is being built at the Longfellow mine near Big Oak and a large boiler is being installed to heat the building and to furnish the miners with plenty of hot water.

COLORADO.

CLEAR CREEK COUNTY.

(Special Correspondence).—For the last four years the Capital M. & T. Co. has developed its property until now it has larger ore reserves than any other company in Clear Creek county. The adit, which is at present 4,700 ft. long, has cut 15 veins, some of which are quite wide. On the largest of these veins, the Etna, the west drift has been driven for a distance of 150 ft. and the ore is in places 10 to 16 ft. wide, while the east drift is also 150 ft. long, but the vein is only 3 to 6 ft. wide. A large force of men is blocking out the orebody and the ore from this work is run to plats at the portal of the adit while the 100-ton mill is being erected. The mill-building is about finished and the installing of machinery has begun. Hendrie & Bolthoff of Denver are erecting the mill. A new 25-drill Leyner compressor has been installed. Wm. M. Cooper is manager of the company.—The Linn Consolidated M. & M. Co. expects to have its new 50-ton concentrating mill finished by Dec. 1; the machinery is being installed by Frank Graham. The company is blocking out large reserves of lead-zinc ore in the Mineral Chief mine.—On the bottom level of the old workings of the Maud S. mine on Douglass Mtn. an 18-in. streak of rich silver ore has been found; this ore is along the hanging wall and had been missed by the earlier miners. Michael Kelly is working the mine under a bond and lease. The old adit is being cleaned out and will be driven ahead to cut the vein at a depth of 300 ft. below the present workings.—The Raymond adit is now 650 ft. long. According to surveys the Paris vein will be reached within 50 ft., at which time it is expected that important discoveries will be made. Two veins have been intersected and more or less mineral is showing, but comparatively little driving has been done. The Paris vein was cut by the Capital adit at a vertical depth of 1,900 ft., the orebody at that point being 3 to 3½ ft. wide; this vein carries gold, silver, and copper. Arrangements are now being perfected whereby the Raymond Tunnel Co. can prosecute operations through the Capital adit. Joseph Raymond of Georgetown is manager of this enterprise.—At a distance of 750 ft. from the portal of the Mohawk adit on Saxon Mtn. a body of ore has been exposed which is 18 in. wide and rich in lead and silver. Apparently the vein is the old Choctaw, whence a production of over \$100,000 was made a number of years ago from shaft-workings down to a depth of 150 ft. J. J. Cully of Georgetown is in charge at this mine.—Eighteen inches of good lead ore has been found at the Edinburgh mine on Republican Mtn. while running the

lower adit to cut the vein below the upper workings. This gives an increased depth of 145 ft. The property is being operated by Nulph & Leisy of Georgetown under bond and lease.—M. J. Riley, leasing on the Sunburst, Democrat Mtn., is stoping on a body of ore that measures from 3 to 3½ ft. in width. The stope is 95 ft. in length, having been carried for 85 ft. About 18 in. of the material is shipping ore, the rest is of good milling-grade.—Butts & Co., leasing on the 240-ft. level of the Astor mine has found two 4-in. streaks of very rich silver ore. This mine belongs to the Red Oak M. & M. Co.; A. B. Montgomery of Denver is general manager.—J. J. White, manager of the Prudential M. & T. Co., has awarded a contract for the driving of the Prudential tunnel an additional 100 ft. According to surveys this will take the heading past the Turner vein, which at surface is of good grade. This property is on Republican Mtn. on one of the richest mineral zones in the Georgetown district. If driven to its objective the Prudential adit will intersect the Pay Rock, Wisconsin, Corry City, and other mines at an increased depth of from 500 to 700 ft. under their present deepest workings. The tunnel is now in 850 ft.

Georgetown, Nov. 7.

TELLER COUNTY.

(Special Correspondence).—Work is progressing rapidly on the Independence mill in which the ore from the dump of the Independence mine will be treated; this will have a capacity of 400 tons per day. It is estimated that this dump will keep the mill in ore for 10 years. The ore will be concentrated on Card tables and then cyanided. Philip Argall of Denver is the consulting engineer, H. E. Nelson construction engineer, and A. R. Minner superintendent of construction.—F. M. Kurrie, superintendent of the Portland mine, is opening up two new levels in Portland ground, one at 1,200 ft. and the other at 1,500 ft.; these are being developed from the No. 2 shaft. As this work interferes with the hoisting, they are not trying to produce full capacity. Work on the 1,500-ft. level has not as yet reached the ore, but the ore has been found on the 1,200-ft. level. A new 30-drill Ingersoll compressor has recently been installed; this is operated by a 300-hp. motor.

Victor, Nov. 8.

(Special Correspondence).—The Trilby Mines Co., for which James T. Stewart is manager, is building a 60-ton mill at its mine. This plant will be arranged so that it can be increased to a capacity of 150 tons per day. An Abbe tube-mill is to be used for fine grinding. Cyanidation will be used. The Gold Sovereign is getting ready to ship 2,500 tons per month to the Golden Cycle mill when that mill is ready to receive ore; this, it is understood, will be about a month from now.—Eaton & Blanchard, who are operating the Goodwill mine under lease, are taking out some ore; they are also working the Bonanza King through the same adit. A new roaster will shortly be installed in the W. P. H. Leasing Co.'s mill. Some changes are being made in the mill which were found necessary after it had been operated a short time. The Isabella mill is handling an average of 125 tons per day of ore which averages about \$4.50 per ton; the extraction is about 80%. Practically all this ore comes from the dump. They expect to install two more leaching-tanks. Geo. D. Kilbourne is manager and A. N. Finn superintendent of the mill.—The Wild Horse mill is under lease to Thos. Kavanaugh; he is treating custom ore in this mill as well as ore from the mine. Last month he treated 700 tons of ore, but he expects to handle more in the future. At this mill the ore is crushed and then treated with cyanide.—The Blue Flag G. M. Co.'s mill has a capacity of 50 tons per day. The ore is crushed wet; the sand and fine are separated in Callow tanks; Butters distributors are used to feed the sand to the cyanide vats while the slime is agitated in specially designed vats having a conical bottom. S. C. Paxton is superintendent, W. H. Jenkins consulting engineer, J. F. Erisman general manager. It is claimed that a good extraction is made at this mill without roasting the ore. This mill is run by electric power.

Cripple Creek, Nov. 8.

MICHIGAN.

KEWEENAW COUNTY.

The Calumet & Hecla, the Wolverine, and the Mohawk mining companies posted notices October 31 announcing a reduction of wages. The Mohawk and the Wolverine reduction is 5% of the present wages, bringing them to the same schedule as before January 1 of this year, when a raise of 5% in wages was granted. This reduction goes into effect November 1. The Calumet & Hecla reduction amounts to 12½% and goes into effect December 1. It also applies to workings on the Osceola and the Kearsarge lodes. As yet none of the other companies have made a reduction, but it is expected that they will.—At the Keweenaw Copper Co. No. 1 shaft the vein in the lower levels is being developed with satisfactory results. This shaft is now 900 ft. deep, and it is expected that by January 1 this shaft will be 1,000 ft. deep. At 825 ft. the station for the 9th level is being cut. In the deeper levels there is less calcite in the vein, and apparently the copper content of the ore is increasing. Eleven drills are being used at this mine. On the 7th level, 675 ft. deep on the incline, a cross-cut is being driven to develop the Allouez conglomerate; this cross-cut is at present 100 ft. long and is expected to cut the conglomerate in the next 125 ft. In this cross-cut about 15 ft. west of the Medora vein a similar vein was cut and some development has been done on this new vein. Another cross-cut to the east of the shaft has been started to intercept this new lode.—About 300 men are working on the Keweenaw Central extension, which is to connect Mohawk and Calumet. This railroad passes near many of the large mines—the Ahmeek, Allouez, Kearsarge, and Centennial. It is expected that the line will be in operation by January 1.—The new sand-conveying system installed at the Mohawk mill is working quite satisfactorily.—It is announced that the Canadian S. & R. Co. will commence work on its smelter at Sault Ste. Marie on the Canadian side December 1. This smelter is to treat copper, nickel, and cobalt ores and will have a capacity of 150 tons per day. Otto Stahlmann, formerly connected with the Calumet & Hecla Co. and the Anaconda Copper Co., is manager. He formerly worked for the Cobalt Smelting Co. of Saxony, Germany, where he acquired experience in smelting ore quite similar to those from Cobalt, Ontario. This smelter will draw from Cobalt and Sudbury mainly for its supply of ore.

NEVADA.

ESMERALDA COUNTY.

The output of the Goldfield district for the week ending Nov. 8 was 1,950 tons of ore having an estimated value of \$204,850. This diminution of output was caused by the fact that many companies have decided to store the ore on their dumps or to leave it in the stopes rather than wait upon the smelters to settle for the ore 45 days after it is received at the smelter. The Nevada Reduction Works refuses to receive more ore, so all the ore not shipped directly to the smelter was shipped through the Western Ore Purchasing Co. The Mohawk Jumbo is still shut down, pending the settlement of the boundary dispute, the Little Florence is not shipping any ore although mining at the rate of 100 tons per day, while the Mohawk is shipping a very small amount. The itemized shipments for the week are as follows: Mohawk mine, 125 tons; Red Top, 50; Mohawk Combination, 650; Florence L. & M. Co., 52; Rogers-Goldfield Syndicate, 112; Florence Annex, 64; Begole lease, 104; Nevadan, 26; Black Butte, 25; Goldfield Daisy, 47. The Combination mill treated 550 tons of ore from the Combination mine; the Kinkead mill 140 from the Red Top.—The shipment this week is the first from the Florence Annex lease, the ore being quite high-grade.—The Little Florence is piling up all its ore at the mine; most of the ore is coming from the 400-ft. level. The cross-cut on the 500 is in 30 ft. and will soon cut the vein. The ore-bins at the mine are filled to overflowing and the ore is being piled on the ground. Owing to the large amount of money in its treasury the Little Florence has been able to keep mining at full capacity without shipping any ore. It is estimated that there is \$250,000 worth of ore on the dump at present.—The Florence Annex, on the

north end of the Firelight claim of the Florence, is now attracting much attention, as a 2-ft. vein of ore, reputed to assay \$800 per ton, has been found in it. This was found Oct. 17 in the west cross-cut of the 300-ft. level, 250 ft. from the shaft. The vein runs 20 deg. west of north; 35 ft. of driving has been done on it already. This lease has five more months to run and a large production is expected from it.—At the Codd lease on the St. Ives the shaft is being sunk at the rate of 3 ft. per day. A drift is being driven to the east on the 10 -ft. level to strike the ore-shoot recently struck on the St. Ives.—The Mohawk Combination lease has only three weeks more to run, so work is being pushed at this lease. The output from this lease is about 200 tons per day, while the Begole lease, a half interest in which is owned by the Mohawk Combination, produces 100 tons per day.—At the Florence L. & M. Co. much development work is being done. The drift on the 500-ft. level is being driven ahead rapidly, and it is thought that within 25 ft.



Map of the New Mining Districts of Nevada and California.

the vein that was cut in the upper levels will be intercepted. The shaft will then be sunk another 100 ft. Some stoping is being done on the 285-ft. level.—At the Daisy mine, near Diamondfield, another rich streak of ore has been found on the 210-ft. level. The company is now working three different orebodies on that level. The Truett shaft, now the main shaft, is being sunk, and in ten days it will have reached a depth of 400 ft., at which depth a station will be cut.—At the meeting of the stockholders of the Nevada Consolidated, Nov. 11, the following board of directors was elected: G. S. Nixon, George Wingfield, J. H. Mackenzie, J. W. Fenwick, J. S. Cook, J. D. Hubbard, and J. R. Davis.—A week ago last Wednesday 20 stamps of the 200-stamp mill at Blair, near Silver Peak, were started. By December 100 of the stamps and all the cyanide tanks will be running. About 200 men are working at the mine and mill. The ore is said to carry \$20 per ton. The plant is run by electric power furnished by the Nevada-California Power Co.

John W. Brock failed to be re-elected president of the Tonopah Mining Co., and instead James S. Austin was elected president and C. K. Lord vice-president. C. K. Lord, formerly vice-president of the Baltimore & Ohio, has been elected president of the Tonopah & Goldfield Railroad Co., R. H. Rushton and J. S. Austin vice-presidents.—During the summer many improvements have been made at the Desert mill at Millers. Additional pumping facility

and more boilers were installed, so that more slime can be handled; within 10 days 5 Woodbury concentrators will be added to the table capacity; 9 Johnson tables are expected to arrive at any time. Oil is now used to heat the boilers, as it is cheaper than coal. The oil supply now on hand is 180,000 gal.; the company also has 3,000 tons of coal in reserve, consequently no shortage of fuel is expected this winter. Last Tuesday a clean-up was made at the Desert and the Belmont mills, but its amount was not given out. The shipments from the Tonopah Mining Co. and from the Belmont Co. to the smelters approximate 200 to 300 tons per day.—At the California mine the ore-shoot, found on the 600-ft. level, has also been cut on the 720-ft. level; a raise from the 720-ft. level is now being driven in this ore. An ore-shoot pitching to the north has also been found on the 600-ft. level.

At the meeting of the shareholders of the Tonopah Belmont Development Co., held in New York Nov. 13, Richard G. Park was elected president to succeed John W. Brock.

NEW MEXICO.

GRANT COUNTY.

(Special Correspondence).—The Leopold Copper Co. has stopped development work at its mines in the Tyrone district, but its concentrator is still in operation. It has a considerable quantity of high-grade ore on hand.—The Comanche M. Co. has purchased the Iron Hill mines near Chloride Flat. The ore will be shipped to the smelter at Silver City and will supply the iron and lime needed as a flux. It is stated that the silver value of the ore is sufficient to pay the cost of smelting.—The Chemung M. Co. has shut down its mines at Copper Flat, in the Santa Rosa district, on account of the drop in the price of copper.—The striking of a rich vein of silver in the old Camp Fleming silver district by Baylor Polk has caused a revival of prospecting in that vicinity. Camp Fleming was a big producer of rich silver ore in the early '80s.—The smelter at the Comanche M. Co. has closed down so that another furnace can be installed and other repairs made. The smelter has been in constant operation for about a year.—The Burro Mountain Copper Co. has closed down its mines in the Burro district on account of the low price of copper.

Silver City, Nov. 8.

OREGON.

BAKER COUNTY.

(Special Correspondence).—At the Golden Star excellent ore is being developed, and the veins are improving with depth. Samples of the ore have been tested with encouraging results.—Rich ore containing much free gold has been discovered in the lower levels of the Morning mine. The strike was made in a cross-cut, and a raise is being driven to develop the ore. The mine is developed by 1,500 ft. of shafts, raises, and cross-cuts.—The United Elkhorn, Intermountain, and Red Dog mines are shipping ore. All the properties are looking well.—The Oregon Smelting & Refining Co. has completed arrangements with several companies in this section to insure a large and constant ore supply for the smelter. The coke problem is a source of anxiety to the smelter people, but it is thought that a supply can be obtained from Colorado.—The Ben Harrison, Independence, and adjoining properties were recently examined and sampled by Walter S. Keith, manager of the Oregon Smelting & Refining Co.—The Oregon Chief mine has been bonded by Ringold and associates, and will be developed on a large scale.—Extensive developments are under way at the Bi-metallic, which was recently purchased by a Cincinnati company.—A large number of Eastern mining men were recently examining mining properties in this district with a view to their purchase.

Baker City, Nov. 7.

(Special Correspondence).—John E. Searles of New York, president of the Cornucopia mines at Cornucopia, is visiting the property with the view of making many important alterations in the company's mill.—Manager Keith of the Sumpter smelter has completed contracts with the Elkhorn Mines Co. and the Columbia G. M. Co., and sufficient ore will come from these mines to keep the smelter continuously in blast after New Year.—Harris &

Boggs have completed arrangements whereby they will continue shipments all winter from the Peacock mine in the Seven Devils district of Idaho to the Sumpter smelter.—John A. Ringold and associates of Cincinnati have purchased the Bi-metallic mine in the Greenhorn Mtn. from Larsen & Richardson.—The Standard Consolidated Mines Co. are installing new machinery at their Standard mine and mill.—On November 1 the Columbia G. M. Co. will have their full battery of 20 stamps in operation.—W. B. Gladding of New York, president of the Sovereign Copper Co., is visiting the company's property on Goose creek.

Baker City, Nov. 9.

The Morning mine in the Greenhorn district is looking well.—The shaft at the Spero mine is now 100 ft. deep, but it is being sunk another 100 ft. On the 100-ft. level 130 ft. of driving has been done; the vein is 4 ft. wide on that level. There is about 40 tons of ore on the dump which has come from the development work done on the 100-ft. level.—Work has begun on the Daines 20-stamp mill.—Andy Larson and S. C. Richardson have found some good ore on their Skyline claim in a lode parallel to the Bi-metallic vein. The clean-up at the Pyx mill was quite encouraging; the mine will run all winter.

BRITISH COLUMBIA.

The ore output of British Columbia for last week was as follows: Boundary district shipped 30,701 tons; Rossland, 6,197; East of Columbia river, 3,699; total, 40,597 tons.

BOUNDARY DISTRICT.

Eight furnaces have been in operation at the Granby smelter this week and two at the British Columbia Copper Co.'s smelter. For the past five weeks the Granby mines have produced an average of 3,000 tons of ore per day. Last week 50 men were laid off at the Granby mines but, as most of these were on development, the output will be maintained. Diamond-drilling has been stopped at these mines for the winter.—About 70 men have been working at the Emma mine until last week when about half of the miners were laid off.—At the Fremont mine the main incline shaft is 150 ft. deep. When a depth of 200 ft. is attained, driving will be done on the lode both to the north and to the south. On the 85-ft. level good ore has been found in the drift which is 25 ft. long.—The pumps are still running at the Brooklyn mine, belonging to the Dominion Copper Co.—About 50 men have been laid off at the Mother Lode mine but the usual tonnage is being shipped daily.—A new crushing plant, similar to that at the Granby mines, will be installed at the British Columbia Copper Co.'s smelter at Greenwood. The jaw-crusher will be large enough to take a boulder 24 by 36 in. and will be run by a 100-hp. motor.—The Snowshoe mine shipped 6,560 tons this week; the Mother Lode, 3,440; the Napoleon, 93; the Granby mines, 20,000 tons.

CARIBOO DISTRICT.

The Slocan-Cariboo M. & D. Co. has received a new Northey pump having a capacity of 325 gal. per minute. This has been installed at its property on Canadian creek and sinking has been resumed.—The damage to the Bear Hydraulic M. Co. property, due to the breaking of the dam early last summer, has been repaired.

ROSSLAND DISTRICT.

The output of the Rossland district for last week was as follows: Centre Star, 3,203 tons; Le Roi, 1,925; Le Roi No. 2, 560; White Bear, 105.—H. H. Claudet is installing a 40-ton mill, using the Elmore vacuum-oil process, at the Giant mine, near Golden. This mill will probably be in operation within two months. The ore carries lead with a small amount of silver.

MEXICO.

CHIHUAHUA.

The Greene Gold-Silver Co. has reduced the wages at its properties 25%. White miners will get \$3 gold instead of \$4, while Mexican miners will get \$1.75 instead of \$2.50. A large number of men will also be laid off. The present mill at Concheno has a capacity of 175 tons per day. The new mill, which is being built, will have a capacity of 500 tons. All the ore will be slimed and a new system of agitation will be used in it.

Special Correspondence.

Mexico City.

Improvements Under Way at Cananea.—Large Furnaces.—Greene-Cananea Mines.—The Democrata.—La Dicha Affairs.—Gloomy Condition of Affairs in Northern Mexico.

Now that there is such a real dearth of important mining news throughout the Republic of Mexico it would seem quite an appropriate time to touch upon some of the new work that was either in course of construction or contemplated when the financial troubles arose in New York and put a check on practically all plans of any great consequence. Most important and on the largest scale of perhaps any other work, was that instituted by L. D. Ricketts on the Greene-Cananea, and for which it was said \$4,000,000 was placed in the treasury. The caving system, more or less after methods used in the Lake Superior copper mines, had been introduced, very materially reducing the cost of mining, and the alterations at the metallurgical end were to give far more economy there and reduce the cost of production of copper from 11 to 13 cents, which it had been costing, down to about 9 or 10 cents per pound. These alterations consisted mainly in increasing the size of the furnaces, so that the plant would be able to treat daily 10,000 tons, instead of 3,000 tons of material, and the enlargement of the concentrating plant from 2,400 tons to 10,000 tons daily, in 1,000 ton units. Of the changes in the smelting plant, four of the eight furnaces had been rebuilt and in commission, and two others were nearing completion, while plans had been prepared for three more furnaces in addition to the eight. Toward the alterations on the concentrating plant little had been done, as it was deemed wiser to rush the furnaces to completion to handle the increased output of mines and concentrator; but now all is in abeyance. The Democrata Mining Co., nearby, which was showing up wonderfully well with large bodies of ore, and had completed the foundations of its new 250-ton stack, built on the same lines as the Calumet & Arizona furnaces at Douglas, Arizona, but a foot longer, and expected to blow in this month, is letting things stand as they were and shipping what little ore is being produced; that which was being handled at the Greene-Cananea plant, is now going to El Paso. The survey for the railroad of the Belen Copper Co., from Carbo to Camp Copete, and which was to give an outlet to a number of large companies such as the Belen, Giroux Consolidated, and the Copete, had been completed and the survey and plans approved by the Mexican Government, but now nothing is heard concerning it. The New York meeting of the stockholders of La Dicha Mining & Smelting Co., acting on the request of a former meeting in Mexico City, had deposed George Mitchell and elected F. A. L. Cassidy, of Fort Glenn, Md., as president in his stead, with Thomas E. Wing as general manager, who were at once most keen on pushing to early completion the 80 miles of railroad from La Dicha to San Marquez, known as La Dicha & Pacific Railroad, and by this outlet to the Pacific place the mines and smelter on a paying basis. But now the silence is oppressive. W. C. Greene who, after selling out the greater part of his holdings in Cananea, moved his basis of operation to the State of Chihuahua and obtained concessions for the erection of several reduc-

tion plants and power plants in that State, and was contemplating the reopening of the old Federal smelter at El Paso, is now spoken of as being close to a receivership and chasing for money to meet his payrolls. In my previous letters in the PRESS I have spoken of the cutting off of work on the Guanajuato Belt Line Railroad and the closing of various mines throughout the country, and it is feared that the end is not yet.

Another correspondent writes: The effects of the sudden drop in the copper market are nowhere more noticeable than in northern Sonora, where the great properties of the Greene-Cananea are now in a state of suspended animation. Only four furnaces out of seven remain in operation and mining is practically at an end. All day long and all night long wagon-trains, burros-trains, and people on foot are pouring down the 60 miles of highway from Cananea to Imuris and thence southward through the Magdalena valley, penniless with the improvidence of Mexican miners and not knowing how they may feed themselves on their long journey to distant homes. The *rurales* or State militia patrol the roads to prevent disorder. Many American workmen are be-



Mexico.

ing retained at reduced wages, but thousands of Mexicans have been discharged. It is reported that early in November the whole camp will be closed down. In contrast, the Phelps-Dodge company is still going on with the work at Nacozari.

The Mexican Central is now running trains to Guanajuato. The slime plant in the Pinguico mill is completed and Carlos Van Law has started a Butters filter-plant at the Bustos mill.

Butte, Montana.

Butte Coalition.—Cessation of Production.—Work of Development.—A Strike in the Parrot.—North Butte Extension.—Butte & Bacorn.

The Butte Coalition Co. has stopped all work at its mines except development work in the Rarus, where about 175 men are still employed. The only ore mined now is that which is taken out in the course of development. Work is going on at 10 different places in the mine and from four of them ore is mined, averaging about 50 tons per day. When the curtailment order went into effect several months ago the Coalition Co. was mining 1,600 tons per day. The company now argues that it can better use its time and treasury in opening its orebodies and blocking them out preparatory to a big output when the demand for copper is again normal. The Rarus shaft is being sunk and that work is to con-

tinue indefinitely. The shaft is now 2,000 ft. deep. The lowest level is at that point and is known as the 17th level, from which the south vein has been cross-cut, but no driving on it has yet been done there. On the 16th level the south vein has been cross-cut and a drift about 100 ft. has been driven on it, opening a splendid orebody, larger and of higher grade than any on the upper levels. The company is also cross-cutting for the north veins and is driving into the Minnie Healey for the purpose of opening that property at greater depth. The Minnie Healey will eventually be mined through the Rarus and Tramway shafts. The new Tramway shaft has reached the 1,100-ft. level, from which a raise has been made for several hundred feet, but the shaft has not been enlarged and timbered all the way. In a month or six weeks the shaft will be completed and timbered to the 1,100-ft. level, when sinking will be resumed. The big steel head-frame at the Tramway is going up. The work had been delayed by a controversy between labor-unions as to whether the ropemen or the structural iron workers should do the work. The ropemen won and are making a record in putting up the frame. The iron workers put up a similar frame for the Boston & Montana at the Leonard mine and it took them 60 days. The ropemen promise to complete the Tramway shaft in 30 days. The Coalition is opening great bodies of ore in the Rarus and Minnie Healey and when the demand for copper becomes normal again the company will be able to maintain a steady output.

Under the management and direction of Arthur C. Carson, general manager, and George Moulthrop, superintendent, the Coalition properties have been tremendously improved, and it is predicted that in a few years they will be among the most important in the Butte district. Nothing is being done in the Corra or Nipper mines at present, though a short time ago some good ore was mined from the Nipper through the Parrot mine.

It has been persistently reported among the miners that the Parrot has made a strike recently, but Manager Gallwey denies it. The Parrot Co. is pushing development and has just completed sinking its main shaft, which is now 2,030 ft. deep. Cross-cuts have been started from the 1,900 and 2,000-ft. stations to intercept the veins south of the shaft. The company has reduced its output to about 150 tons of ore per day, which comes from the 1,600, 1,700, and 1,800-ft. levels, where some development work is also going on. The Parrot Co. is also working the Little Mina, but that property is yielding only a small amount of ore, which is mined on the 800 and 1,800-ft. levels. The Little Mina shaft is 1,000 ft. deep.—The North Butte Extension Co. has completed a station at the 300 and work on the cross-cut has started. The station is 15 ft. square and is big enough to accommodate a large pump. The vein is not far from the shaft, and it was uncovered at the surface while a foundation was being made for the engine-house. Several vein stringers were cut by the shaft. The water coming from the shaft is also highly impregnated with copper. John A. Ryan, the superintendent, expects that the vein will be reached within 60 ft. of the shaft, and that it will be found to carry commercial ore. A second boiler was recently added to the plant and the company is now equipped for sinking to a depth of 1,200 feet.

The Butte & Bacorn Co. has retained a small force of men at the mines and is still working on the two drifts on the veins opened at the 1,000-ft. level. While no commercial ore has yet been found, the improvement continues and Fred Bacorn, the manager, is still confident that ore will be found at the present depth.—Work had been resumed at Clark's West Stewart mine, which had been suspended for several weeks while a new steel dumping

equipment was being installed.—The Butte Central and Boston lessees are paying good royalties again and the company is more than making expenses from that income.

Johannesburg, Transvaal.

September Output.—Effects of Poor Labor.—Details of Production.—Increased Stamp-duty.—Future of the Industry.—Lead Mining.—The Cyferbult Diggings.

On the whole, the output of gold for September can be considered satisfactory. September was a 30-day month, one working day less than August, and there were nearly 3,000 time-expired coolies sent back to China, so that a new record output was impossible. The output for the Transvaal amounted to 538,034 oz., valued at £2,285,424, of which the Rand contributed 517,746 oz., valued at £2,199,247. One or two of the Chinese mines have been hard hit by the loss of their coolies, who are now highly skilled mine-workers. In the place of the Chinamen raw Kaffirs have been taken on, many of whom have never seen a mine before. Several months will elapse before these Kaffirs are efficient, and the mines that have lost the coolies will show decreased profits unless some rich stopes can be drawn from. One mine that has been earning about £18,000 profit per month showed a drop of nearly £5,000 for September, while another Chinese mine that lost its coolies last month fell from £10,000 profit to £2,000. These figures show what a serious thing it is to try to run a mine with raw labor. For a few months managers of Chinese mines are going to have great difficulty in keeping their average profits. Working costs are bound to go up on these mines, for until the Kaffir is trained to his work he accomplishes very little. The most tantalizing thing of all is that the Kaffirs leave soon after they are broken in and you start afresh with a new crowd.

The Robinson gold mine is again the leader as a producer, the amount of gold turned out by this company for September being 25,415 oz. Second on the list is the Simmer & Jack with 24,577 oz., while the Robinson Deep is third with an output of 19,859 oz. It is interesting to note how the duty per stamp has increased of late, owing to the introduction of tube-mills. During September there were six mills on the Rand showing a stamping duty of seven tons and over per stamp per 24 hours. On the Luipaard's Vlei Estate the exceedingly high duty of 8.7 tons per day was reached. As regards sorting, the mines show considerable variation, from 37% in the case of the Princess Estate mine to no sorting in the case of the Consolidated Langlaagte mine.

During the month some important evidence has been given before the Government commissions. The witnesses, who speak with authority, such as consulting engineers and mine managers, are not over optimistic on the future of the mines of the Rand, and it is generally agreed that unless costs can be brought down to somewhere between 16 and 17 shillings the margin of profit in 10 years will have gone to the vanishing point. If the policy of the Dutch Government is carried out the chances of any great reduction in working costs are small, and as the Het Volk party are in for an indefinite period, perhaps until the end of time, it is no wonder that mining men view the future with grave apprehension.

The monthly report of the Edendale Estates shows that good progress is being made on this lead proposition. Besides a fair amount of development work during September, 214 tons of concentrate containing 80% lead and 60 tons of zinc blende containing approximately 45% spelter were shipped. After this month it is hoped to have the furnace working satisfactorily and to be in a position to supply the local market. There is a consider-

able demand for pig lead on the Rand, especially in connection with the Tavener process.

The men at work on the Cyferbuilt alluvial gold diggings, in the Krugersdorp district, do not seem to be meeting with any great success. They have much to contend against. Their Kaffirs have become expert thieves, and according to one old prospector the natives get away with a good deal of gold. The dry crushers which were sent to the diggings have proved a failure and the men prefer to pay the very high price asked for water. Unfortunately, also, there has been a great deal of the ground locked up, and until the present gold law is amended little can be done with the claims held under license. There are several small veins in the district and a few small batteries, from 5 to 10 stamps, are at work. The gold occurrence is erratic, however, and the position of the owners is somewhat hazardous. One or two of these men have made a bad mistake in starting to crush before they had opened up sufficient tonnage, and one man is now forced to close down, after a run of a month or so, in order to develop. The prospects of the Cyferbuilt district are not promising. A few men seem to be making a living, but not much more.

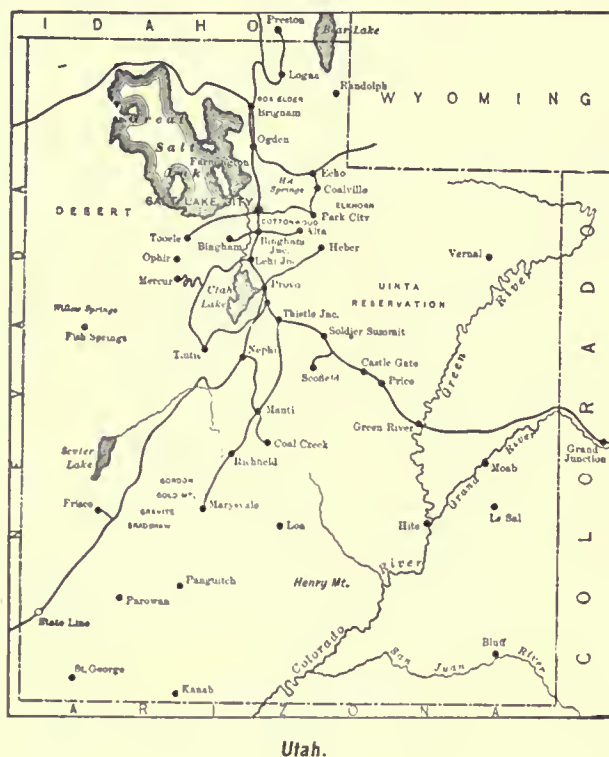
Salt Lake, Utah.

Smoke Suit Decision.—Probable Effect.—Reduction in Wages.—Strike Settled at Park City.—Ontario Adit Repaired.—Bingham Smelter Closes.—Shipments From Tintic.—Litigation Ends.

The United States Court of Appeals at St. Paul has affirmed the judgment of the United States District Court of Utah in the smelter smoke cases. The effect of this decision, unless modified in some form, will be the closing of some of the existing plants, particularly those to which copper ores are sent for treatment. The injunction is made permanent against the Utah Consolidated, the Bingham Consolidated Mining & Smelting, and the United States Smelting, Refining & Mining companies. The American Smelting & Refining Co., while it was a defendant in the cases when tried, will not be affected by the decree for the reason that a compromise agreement or stipulation has been entered into between the smelting company and the farmers who were plaintiffs in the cases tried. By the payment of a large sum of money and the installation of bag-houses and other mechanical appliances for the arrest of the sulphur dioxide in the fume, the Court was asked for a modified decree permitting the American company to continue its smelting operations at what is known as the Murray plant, which treats lead-silver ores. The copper smelter at Garfield, operated under the management of the American Smelting & Refining Co., has never entered into the controversy, it having been built at a point where little or no damage can be done to growing vegetation or live-stock. Inasmuch as the Bingham Consolidated Mining & Smelting Co. has practically ceased the treatment of ore at Bingham Junction and is soon to abandon its smelter entirely, the only concerns left to bear the burden of the Court's decree are the Utah Consolidated and the United States companies. The Utah Consolidated has selected another site and is preparing to build a smelter thereon, probably next year; but the United States company has taken no definite steps in that direction; the management contending that it is not a physical impossibility to control the situation to the extent of doing no damage to the surrounding country. It is believed that the case will be carried to the Supreme Court of the United States and that in the meantime the smelting companies will be permitted to continue the operation of their plants under an indemnity bond. In his decree, Judge John Marshall, of the Utah Court, enjoined the defendant smelt-

ing companies from smelting ores containing an excess of 10% sulphur in the charge or sending out in the atmosphere any fume containing arsenic.

The operators of Park City have agreed on a uniform wage-scale for that camp; it becomes operative on November 15 and amounts to a reduction of from 25 to 50c. per day as compared to the schedule in effect during the past year. Engineers are to receive \$4; timbermen, \$3.50; machine-men, \$3.25; station-tenders, \$3.50; all underground men, \$3; carpenters, \$4; carpenter's helpers, \$3; blacksmiths, \$4; blacksmith's helpers, \$3; tool-sharpeners, \$3.50; motormen, \$3.25; firemen, \$3; millmen, carpenters and construction, \$4; repair-men, \$3.50; repair-men's helpers, \$3; millmen, \$3; laborers and outside men, \$2.75. This scale does not apply to boys under 21 years of age, who may be employed underground at the rate of \$2.50, or outside at \$2 per shift.—The Miners'



Union has called off the strike which was declared against the Daly West, Ontario, Daly, and Little Bell mines about two months ago. The men struck because the management of the Daly West discharged a shift-boss who belonged to the union. The miners' organization not only demanded his reinstatement, but also demanded union recognition, which was denied. The mines were closed pending the strike; but preparations are being made to resume operations.—The Ontario drainage adit at Park City is about to be restored to its former usefulness after having been closed for more than two years on account of caves. The main channel has been tapped from a drift around what is believed to be the last of the caves between shafts No. 2 and 3 by means of a 3½-in. diamond-drill hole. Other holes are being drilled, through which it is expected the mine will become drained. The task of unwatering has been a most difficult one and decidedly expensive. The restoration of the adit will enable the resumption of work on the lower levels of the principal mines of the district which have been flooded since the adit was damaged.

The orders to stop work at the Bingham Consolidated smelter has caused a shut-down of the Grand Central mine at Tintic. The mining company had a contract with the smelting company through which the latter obligated itself to purchase the entire output of the mine,

and now that the contract has been abrogated through the shut-down at the smelter, the Grand Central is left without a market for the time being. It is only in exceptional cases that the smelters still active are accepting ore for treatment that they have not already contracted for—the ban being placed particularly upon silicious ores. The closing of the Grand Central is the first serious shut-down reported from Tintic. Several properties there have curtailed their output, but with this one exception there has been no complete shut-down. Ore shipments from Tintic last week amounted to 109 carloads; the contributing mines and amounts being: Ajax, 2; Beck Tunnel, 6; Bullion Beck, 5; Colorado, 9; Centennial Eureka, 42; Eureka Hill, 2; Eagle & Blue Bell, 1; Grand Central, 4; Lower Mammoth, 5; Mammoth, 2; Scranton, 6; Tintic Iron, 11; Uncle Sam, 5; May Day, 5; Victoria, 2; Yankee Con., 2 carloads.

The seven years of expensive litigation between the Grand Central and Mammoth Mining companies, both operating in the Tintic district, has ended in a victory for the Grand Central, which has been awarded a verdict of \$91,349, which with interest at 8% per annum (\$58,463), made an aggregate total of \$149,812. The Grand Central brought suit in the first place for \$500,000, the alleged valuation of ore extracted from the Silveropolis claim, but which the Mammoth company contended it owned by reason of extra-lateral rights. Coincident with the decision rendered against it and in favor of the Grand Central, the Mammoth Mining Co. marketed a carload of ore that brought over \$100,000. The lot consisted of 53 tons, 18 of which averaged 145 oz. gold per ton; 13 tons went better than 21 oz. in gold. The company will sink the working shaft to 2,500 feet.

The shaft at the Apex mine, one of the Tintic possessions of F. Augustus Heinze and associates, is down 1,150 ft. The ore being developed there is similar in character to that in the Eagle & Blue Bell mine.

Three Utah mining companies posted dividends last week. The Mammoth, \$20,000; May Day, \$22,000; and Uncle Sam Consolidated, \$15,000.

Wallace, Idaho.

Mines of the Coeur d'Alene.—Effects of the Financial Stringency.—The Surprise Mill Stops Work.—Bunker Hill Dividends.—Native Copper in Slate.—The Lookout District.—National Mine.—Missoula Copper Company.

The depression in both the financial and metal markets have not been without effect on this district, but at the same time mining activity is greater than ever before in the history of the country. One or two of the larger companies have closed their mills and reduced the size of their dividends; but most of the smaller companies are active, and there are more prospects under development than ever before. New strikes are being reported almost daily, and everything is looking prosperous.—The mill of the Surprise mine at Wardner has just been closed owing to the refusal of the smelters to handle the ore, and about 40 men have been thrown out of work. The mill had only been completed about a month, but it is promised that a market will be found for the ore by the beginning of the year. The development of the property will continue in spite of the shut-down, and additional machinery is being installed at a cost of about \$40,000.

The Bunker Hill & Sullivan Mining & Concentrating Co. has paid its 123rd dividend, amounting to \$120,000. This makes the dividends paid since January 1, \$1,860,000, and the grand total paid by the mine, \$9,726,000.—An assessment of two mills per share has been declared on the capital stock of the Echo Mining Co., the property of which adjoins the Oom Paul and Moonlight

mines at Burke. The mine looks promising; four feet of blue talc and quartz, carrying silver, was recently encountered in the west drift about 1,200 ft. from the portal of the tunnel. Work on this strike is being pushed as rapidly as possible.—An important strike of native copper embedded in slate has just been made in the Hypotheek mine at Kingston; assays show from 4½ to 5% copper. The ore was encountered on the 180-ft. level and at a depth of about 475 ft. The lode is about 40 ft. wide, the native copper ore being about 5 ft. wide. This is the only mine in the Coeur d'Alene where native copper has been encountered in quantity.

Some splendid ore is being encountered in the Lookout district and great activity prevails. The Copper Head



The Coeur d'Alene, Idaho.

Mining Co. has just broken into the lode at a depth of about 167 ft. The lode is about 7 ft. wide and contains a pay-streak of from 6 to 8 in. wide, samples of which show an average assay of \$58 in gold, 20% copper, and 18 oz. silver. Many similar strikes have been made in this vicinity and the district promises to be one of the best in the country. In every case the ore had been high in grade and good in quantity.—The Oom Paul mine at Burke has been closed down and the pumps have been drawn. No reason for the shut-down has been made public; but it is understood that the general depression in business has been the cause. A force of about 12 men has been at work on this property.—A suit has been commenced against the Idora Mining Co. by Therrett Towles for the purpose of recovering something over \$1,000 of wages, which the company has failed to pay seven of its employees. The mine is an excellent one and already several shipments of high-grade ore have been made and the erection of a concentrator was contemplated in the near future. It is said that a sensational suit is about to be filed contesting the title to the property and in view of this it has been practically impossible to dispose of the treasury stock so as to finance the cost of development. The management reports that there are still 700,000 shares of stock in the treasury.

A one-machine compressor is about to be installed in

the Hector mine between Wallace and Burke. The drift in the property is now in about 400 ft. and it is calculated that the men still have about 300 ft. to go to reach the ore-shoot at a depth of approximately 600 ft. Some good ore has been encountered in the upper workings.—A rich strike of ore has just been made on the National mine in the Mullan district. The strike shows a fine body of copper ore and has not yet been fully explored. The ore was encountered in the shaft and at a depth of about 125 ft. Samples have been brought to Wallace and it is expected that these will assay from 10 to 25% copper. As soon as the full extent of the strike has been ascertained a tunnel will be driven.

The annual meeting of the stockholders of the Missoula Copper Co. was held at Mullan on November 5 and the following officers were elected: President, Robert McCormick; vice-president, C. A. Barnes; secretary, Thomas G. Kennedy; and these together with J. N. Thennes, H. Billberg, J. K. McLeod, and Harry Chaney compose the directorate. The report of Robert McCormick, who is also manager of the property, was read, and according to this 850 ft. of tunnel work has been completed and the company now proposes to run an extension to the Independent tunnel, a distance of about 750 ft., to get under the ore on the No. 2 tunnel. All the winter supplies have been laid in and a new transformer station will be built. The company's financial statement shows that there is over \$6,000 in the treasury.

Leadville, Colorado.

Ore Production.—Important Lawsuit.—Treatment of Zinc Ores.—The Weston Pass District.—Consolidation on Rock Hill.—Electric Power Transmission.

The production of the Leadville district during October amounted to 71,000 tons, about 60% of which was treated by the local smelters, and of this tonnage 8,000 tons of zinc ore was shipped to outside smelters.—A very important mining suit was recently settled at Washington when the Supreme Court refused to enter a petition for a re-hearing in the case of N. A. Munn against the Ibex Mining Co. This suit has been in the various courts for a number of years. It appears that about 15 years ago the Ibex Co. leased a group of claims adjacent to their ground; among these were the Little Stella, San Jose, Archer, and others, and in order to facilitate business transactions between the numerous owners of the various claims, the Archer consolidation was formed and the property placed in the hands of Clinton Reed as trustee. A bond and lease which was executed for a large sum was later taken up by the Ibex Co. N. A. Munn, one of the minority owners, brought suit on the basis of fraud and has fought the case almost continuously since.

At a late meeting of the stockholders of the New Monarch Mining Co. the directors elected were: J. C. Kortz, J. M. Thomas, T. H. Hogsett, G. A. Steinbremer, and W. H. Green.—The Bessie Wilgus mine on Rock hill, which closed down a few months since, has again resumed operations under the management of Robt. B. Estey. The owner, T. B. Wilgus, of Morgantown, W. Va., disposed of a large portion of his holdings to Eastern associates, who will proceed with the development work formerly outlined. The last work on the property was the sinking of the main shaft to a depth of 700 ft., at which point some driving was done but without opening new orebodies. Mr. Estey was the former manager, and is considered one of the best informed mining men in this district.—Development work on the Emerald property, near the Chalk ranch, continues, and a good vein of silver ore has been cut. The manager reports that the vein was cut at a point about 480 ft. from the portal of the adit.

The A Y & Minnie, one of the holdings of the Western Mining Co., has closed down the concentrating mill and made contracts with the Canon City plant to treat the lead-zinc ores. The Canon City plant is now handling 100 tons of this product per day, while the purer lead ores are being treated by the local smelter. A heavy demand by the smelters for silicious ore continues, and this demand has augmented the supply of that class of material from Fryer hill and vicinity.—Fred Hoffer is overhauling the shaft on the Hoffer property and is about ready to begin development work. A large pumping plant was installed last summer on the property and a promising contact was opened. It is upon this contact that the development work is to be pushed.—After several weeks' delay, due to a lost sinker, the drill-hole on the Neusitz placer has been cleared and a diamond-drill is being installed to proceed with the boring. It appears that the hole is at or near the solid formation at a depth of 620 ft.—The lessees on the old Seneca property, L. Bolton, A. Wallace, and L. E. Jorstad, are shipping from a strong shoot of iron ore at the 300-ft. level, which runs 10 oz. silver and 45 to 50% excess iron.

The season's work at Weston Pass has been most satisfactory. The Ruby opened a good body of iron ore and shipments will be made before winter puts an end to operations there. Also, the shaft on the Collin Campbell cut a workable ore-shoot. On the whole, mining men regard the Weston Pass as a very promising district since the silver-lead deposits thus far opened indicate both strength and continuity.—A Rock hill consolidation styled the Bolcoath Leasing & Exploration Co. has been incorporated and controls the following properties: Only Chance, Oro City, Ben Burb, Great O'Sullivan, and Raven. The Ben Burb will be developed through the Raven, and a force of men has been put to work on the Only Chance to prepare the workings for operation. This ground is regarded as exceptionally promising, and the work planned will be the first systematic development done on this property. Recent shipments have been made from the Only Chance and Raven; these proved the ore to be of good grade.—The work on the Mammoth property, while not resulting in the early success anticipated by the promoters, is being vigorously prosecuted. The vein, which was cut between the 500 and 600-ft. levels, is being prospected and the drift on that shoot is now in about 75 ft. Throughout this distance the shoot is from two to four feet wide and is rich in silver. The drift at the 600-ft. level is being run west of the porphyry dike and at the same time one drift is being run to the east and one to the south from near this level. J. A. Shinn has been recently appointed the manager of this property. There is now less trouble from water than at any date since the Wellington Co. took hold of the Mammoth property. While the pumping equipment is capable of handling 1,000 gal. per min., it is only being worked at about half that capacity.

Electric transmission lines are being extended from the Leadville power-plant to Kokomo and Robinson; the power contracts call for power in those districts to be delivered not later than December 1.—The Fanny Rawlings continues to make large shipments of copper sulphide ores and development work is planned on an extensive scale for the future. A winze is being sunk on the claim nearest the Ibex property, which will enable development work to proceed from a point below the present levels. An electric pump will be installed to handle the large flow of water.—The Covey lease on the Hilschle property is still shipping a large tonnage of carbonate lead and iron ores. A drift that was run to the south above the Cambrian quartzite has cut a strong shoot, probably an extension of the Wolcott orebody.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

A GOOD, WELL-CALENDERED RUBBER BELTING made with 30-oz. duck and new rubber has a thickness of about $\frac{1}{16}$ in. per ply. The safe working strain for a belt 1 in. wide varies from 15 lb. per ply for a 3-ply belt up to 18 lb. for an 8-ply belt.

THERE are six common methods of testing lubricants: For chemical content; for specific gravity; for relative viscosity when new; for gumming action; for flashing and burning points; and by the testing machine. The last is the best method because it approximates working conditions. Oil-testing machines consist of a pendulum hanging in capped bearings, the pressure in which can be regulated by means of screws. When the journal is rotated the pendulum points to a graduated scale, from which the friction per square inch of journal can be read directly.

THE question regarding the water rights to a spring cannot be satisfactorily answered without more definite information. It will be necessary to know in what State or Territory the spring is situated, as the laws regulating the right to appropriate, and the manner of appropriating, water are not the same in all parts of the arid West. The laws of Nevada differ from those of Arizona and both from the laws of California. It will likewise be necessary to know whether the spring in question rises to the surface and flows in a definite channel or is merely formed by percolating waters.

WITH the exception of one mine all the mines at present worked in Rhodesia were worked long ago by the 'ancients.' Often the smoke marks on the rock faces and even the charcoal from the old fires of these ancient miners are found on clearing out an old pit. Conchoidal markings on the rock surfaces are characteristic of the former breaking of the rock by means of fire and water. The deepest of these ancient workings on the veins is 250 ft. in depth; many of these ancient pits were 100 ft. deep. In some places the 'ancients' did considerable placer mining; their tailings are so poor as to be worthless now.

It is difficult to make electrical machinery fool-proof, and this is one of the reasons that electric drills have never been very successful about mines. Frequently an electric drill, when run by the company experts sent to introduce them, is highly successful, but when they are placed in the hands of the average miner, who knows practically nothing about electricity and who is generally operating the drill in constant fear of a shock, the drill quickly gets out of order. Apparently the shock of drilling and the rough usage that rock-drills receive underground is too great a strain for electric machinery to withstand.

AIR-COMPRESSION by means of falling water is simple, efficient, and practical. The cost of installation and of operation is small. There are several marked advantages of this method of air-compression; the compression is isothermal and consequently it does not carry any excess moisture to be condensed later in the pipes, air-drills, etc.; the air is pure and is not contaminated with evaporated or burned engine-oil; as there are no moving parts in such a plant, practically no attention is necessary during its operation. The efficiency of a plant using this method is from 75 to 83% of the theoretically possible effi-

ciency obtainable from the water. The use of this method is restricted by patent rights but recently several such installations have been made, notably the one at the Victoria mine in the Lake Superior region.

THE mining laws of Rhodesia are quite similar to those of United States. The mining engineers, who were asked to frame mining laws for Rhodesia, upon investigation found that they were handicapped in their selection. Cecil Rhodes had promised the early prospectors that they could follow their veins wherever they went in depth. Consequently it was necessary to accept the law of the apex. Much of the litigation resulting in the United States from the apex law has been avoided by providing that the first locator always has prior rights no matter whether he is located on the main vein or only on a stringer.

THE use of electricity about mines increases in importance each year. The best pumping practice in deep mines favors the use of electrically driven centrifugal or turbine pumps; many electric locomotives are used for underground haulage; frequently ventilating fans are driven by electricity; the stations and drifts at all large mines are now electric lighted; electric push-buttons and electric flash-signals have taken the place of the bell-rope and rappings on pipes; electric hoists are now becoming more popular and increase in size each year. But electric drills are still as unsatisfactory as ever except that a combination electric-air drill is proving satisfactory.

IN the absence of any State law in California defining the manner in which a mining claim is to be monumented, the provisions of the Federal law must be followed. This requires that the claim should be marked on the ground so that its boundaries may be readily traced. As the object of the requirement is to enable the next comer to determine by surface inspection where the boundaries of the previously located claim are, the marking should be by substantial posts and monuments at the four corners at least, and, if in a wooded or bushy country, the lines between the corners should be blazed or the brush removed. This is, next to discovery, the most important act in the perfection of a lode mining location. While the courts are very lenient in construing the acts of a locator who is the first discoverer of a mine, great care should be taken to monument the claim properly.

THE cost of patenting mining claims will depend largely upon the locality and its proximity to centres of population. The only charges fixed by law are the Surveyor-General's fees, the fees of the Register of the Land Office, and the Government price of the land. Deputy mineral surveyors usually charge a *per diem*, ranging from \$10 to \$20 per day and transportation. Charges for publication vary in different papers, as do the charges of attorneys. An estimate based upon a recent patent application may be given by way of illustration, covering a group of eight contiguous lode-claims of the full size, 20 acres each:

Surveyor-General's fees, \$25 per claim.....	\$ 200
Deputy mineral surveyor " " "	200
Attorney's fees.....	300
Publication of notices.....	160
Purchase price of land.....	800
Register of Land Office.....	10
Total.....	\$1,670

As a condition precedent to the issuance of a patent, law requires \$500 worth of work or improvements for each claim aggregating \$4,000 for a group containing eight claims. This, of course, is in addition to the schedule of fees above set forth.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

Grass Roots.

The Editor:

Sir—Long acquaintance with your writings and editorial policy ill fitted me for the shock which I have just experienced in seeing that you have lent your columns to the education of fake mining promoters. As soon would I expect to see in 'Concentrates' advice as to the proper milling of bogus dollars or the proper pickle to give brass twenty-dollar pieces so as to make them more effective.

Under the head of 'Technical Writing' was a letter signed by G. B. W., in which he takes issue with you for using the expression 'grass roots.' It appears from the letter referred to that this expression, with others like 'red metal,' 'yellow metal,' and 'proposition,' is a splendid danger signal to warn the would-be investor. Hence they should be all tabooed by "honest miners" and severely left to the fake promoter.

I think, if such is the case, that a grave mistake was made in thus publicly exposing the trick. While it is proper to expose the fake, one should be very careful as to how it is done. It should have been made the object of a private circular to your subscribers. For now that the faker knows we are on to his private *argot*, he will abandon it and either use good English up to the standard of G. B. W., or invent a new shibboleth which might be more effective than the old one. Then would the poor would-be investor be lost indeed; especially if the promoter commenced to dip his pen into the well of pure English undefiled. Great molders of public opinion have all been purists. John Bright and Mark Twain owe their influence to the purity of their English. Just think of the awful effect if promoters ceased to write of 'grass roots' and modeled their style on the excellent letters that appear in the MINING AND SCIENTIFIC PRESS! Investors would cease to be 'would-be' and become so in fact. Widows and orphans, together with the poor seamstress, would be robbed of their little all in increasing numbers and the wicked promoter would flourish like the proverbial bay tree.

Now as to the poor old terms 'red metal' and 'yellow metal,' I have nothing to say. But I do plead for 'grass roots.' Please let it remain respectable and don't prohibit it yet awhile on the MINING AND SCIENTIFIC PRESS 'style sheet.' Really there is a place for it, for it is not synonymous with 'surface.' Let us be exact and scientific as G. B. W. demands. Let us examine the evidence. First, how deep has G. B. W. found grass roots? Second, how does he know they were grass roots? Third, what are grasses? I have seen roots in mine workings coming from surface to depths of more than 100 ft., but I don't believe they were roots of grasses, but looked roots of water-seeking shrubs or trees. The longest roots of small plants I have seen were of alfalfa, but, not being a botanist, I don't know whether these are strictly grasses or not. Anyway, this case is out of count as I never found a vein in an alfalfa patch or alfalfa growing on a vein. Certainly 'grass roots' don't mean 'surface.' The surface is the exterior part of anything and grass roots don't grow on the superficies but underground. So G. B. W. is inexact again.

I am now opening up a vein in granite covered with 12 ft. or more of soil in which are innumerable grass roots, shrub and tree roots, etc. The granite is hard and no grass roots can penetrate. Now this vein does

not come to surface as I understand the word, although in the 'new' science it may be re-defined. Where does the vein come to? Am I a nature faker if I say it comes to grass roots? Let us be sensible in our use of language and because scoundrels misuse a good old word, the meaning of which we all understand, I see no reason for us all to stop using it. We are told on good authority that the devil quoted scripture. Are we all to be debarred from the use of a goodly text?

Now for my part I am going to say 'grass roots' (and when provoked even write grass roots) once in a while, and when I want to get into a fight on the modern mining terminology I shall look for a worthier foe.

INGENIERO.

Las Chivas, Chihuahua, Mexico, October 18.

The Barnes King Affair.

The Editor:

Sir—I wish to point out that I had absolutely no connection with the Barnes King property prior to the flotation of the Barnes King Development Co., nor did I make a report of any kind on the property previous to December 22, 1906. I further wish to emphatically state that I made no reports to aid or in any way to assist in its flotation, and that the company was formed before I left to inspect the property for the first time. I was not engaged as an examining expert for either the promoters or the company itself to place a valuation upon the mine. A copy of Mr. William Word's report was shown to me, and I was asked to give the company my services as consulting engineer. I consented to do so, and gave the greater part of my time to its affairs for the first six months. I was instructed to forward my reports to the president of the company and to receive from him directions as to the policy to be adopted regarding operations.

I made a preliminary report dated December 22, 1906, after an inspection of the property. This report was merely one referring to the existing conditions of the property as they appeared at that time and did not go into the matter of values except in a casual way. I was never at any time so favorably impressed with the assay values of the property as others appeared to be.

In January of the present year I advised that the property was very low-grade, and on April 3 I presented a report giving measurements and values, which showed that I estimated 29,324 tons, showing a gross value of \$121,798. This was all the ore I estimated blocked out above \$3. This report was sent to the president of the company accompanied by assay maps. There is a great quantity of ore which will assay under \$3 and the engineering problem is to make this ore pay.

The president was continuously in full possession of all facts regarding the property. Assay-sheets were mailed regularly to New York, together with cost-sheets and full financial statements, and it is difficult for me to understand why the directors appear to have been so much in the dark regarding the value of the mine. All I can say is that all information was sent regularly from the mine and was in the hands of the president, and financial accounts of the mine went also regularly to the treasurer. The policy and the work carried out was that directed and authorized by the president of the company. The conditions at the mine, however, did not satisfy me, and in May I requested to be relieved of my responsibility, and frequently made further applications from that time on. It is absolutely untrue that my resignation was requested by the board or the president, and it was not until the stockholders' meeting in August that I succeeded in being notified that I could be relieved of a position which

was very distasteful to me on account of the low-grade nature of the mines. I desired to see another property taken up in order to relieve stockholders who had invested in the Barnes King Development Co., and it was for this purpose that I remained in the company's service longer than I intended. When I found that this plan could not be put into effect, I absolutely refused to further act as its engineer.

I had no control whatever or any interest in the company's financial affairs, and did not know their condition. My connection with the property was purely professional, and I was in a similar position to the mine as a doctor is to a sick patient who has little hope of recovery, but who still needs attention. I was never invited to attend a meeting of the directors, but had to transact all my business with the president directly, and to him I tendered all of the engineering advice that the company was entitled to.

Professional considerations require that an engineer can only report or receive instructions from such officers or persons as he is directed. Personally, I feel that it is not my part to discuss this matter further, but merely desire to point out my relation with the company, which has been misunderstood. My professional work is open to criticism by any one, as both engineer and layman are entitled to an expression of opinion on the work already done, but I must allow the public to form their own conclusions regarding the present state of the company's affairs. About its promotion I know absolutely nothing, but believe the mine was purchased in good faith.

R. B. LAMB.

New York, October 23.

Greek Gifts.

The Editor:

Sir—I like your article about Andrew Carnegie and his gifts. It is the pride of my life to know that the parish in which I live, Marylebone, refused his offer of a free library. Other parishes in the London district and elsewhere are saddled with the cost of extra upkeep, much to the ratepayers' distress. Since the progressives were routed at the County Council and Borough Council elections earlier this year, the free libraries have not been allowed to spend public money so prodigally.

Carnegie's gifts remind me of the old story, which no doubt is familiar to you, of the man who plodded through life diligently and raised a family as a man ought to, and always managed, by strict attention to duty and by the full use of such abilities as were allotted to him, to pay his way and put a little aside for unforeseen eventualities. His good conduct and general rectitude marked him out among his fellows, and one day his admiring friends made him a gift, which took the form of a really first-class upright grand piano. It had such a lovely rosewood case, and it made his furniture, which was only whitewood stained mahogany, look rather shabby. It worried him to see his wife discontented with the chairs that had hitherto done duty, and so he bought a new suite, which cost him \$150. The suite was upholstered in best plush and the carpet suffered in comparison. And so on. Finally the poor man was saddled with the cost of new furniture and furnishings generally throughout the house, silk skirts for his wife, music lessons for his daughters, etc. I forget what happened to the man, but it was either bankruptcy, splits and hatred among the members of his family, or suicide, perhaps all three.

This letter is not exactly suitable for publication, but if you should print it, let me sign myself

A BELIEVER IN FREE GIFTS.

London, October 11.

Professional Customs.

[The questions to which reference is made in these letters will be found in our issues of October 5 and 12.—Editor.]

The Editor:

Sir—My views on the "searching questions" which you sent me, regarding professional ethics and procedure, are as follows:

1. In the hypothetical case given, I should think it would be better to name a fee for the examination, assuming that it could be completed within one month, and a *per diem* charge for all additional time occupied in the work.

2. I do not think it advisable or necessary to have a written contract with the employer, and if the engineer does not consider that the letter or telegram engaging him for the work is sufficient, it would be better for him not to undertake it at all.

3. I should think it quite proper to ask for a retainer, certainly sufficiently large to cover the actual outlay for traveling and living expenses, before starting.

4. It is usual, I think, to charge the client with the cost of equipment, although I think the engineer should always furnish his own sampling outfit and instruments.

5. (a) I do not consider that any of the items enumerated should be charged to the client.

(b) The engineer, if his expenses are for account of the client, as is usual, is, I think, entitled to the best first-class passage on train or shipboard, and also at hotels in the mining district. In the event of his being in a large city, however, at his employer's expense, I think he should either stop at a moderate-price hotel, or make up the difference himself.

(c) I do not think this procedure advisable under any circumstance.

(d) I think a detailed expense account covering all items advisable.

(e) I do not think it customary to take vouchers for traveling or living expenses, although this could be well done if the sums are large.

(f) I should not consider it advisable to charge these expenses.

(g) The statement of expenses is usually rendered at the end of the engagement.

6. The client is certainly entitled to any information that the engineer may have at any stage of the engagement, but the latter cannot be too careful in committing himself to any opinion, until he has thoroughly investigated all the facts and data, any part of which might cause him to change or modify his opinion later.

7. The young engineer will avoid much misunderstanding and possible pitfalls, if he keeps firmly established in his mind, that the results of his examination are the property of his client, and that such information can only be legitimately used with their consent; in the event of his wishing to buy shares in the property in question, an excellent way of avoiding any misunderstanding, and also showing his belief in his own judgment, is to buy the shares through his clients and with their knowledge and acquiescence.

8. The remarks under No. 7 will also apply to this question.

9. There certainly should be no objection to publishing a description of the district visited after obtaining the consent of the client.

10. It is often expected of an engineer to say 'Yes' or 'No,' but this is sometimes impossible; certainly it would be to reach "a definite conclusion" if "the facts obtainable are insufficient for an intelligent opinion." If clearing out the drifts will enable him to do this and

he has been asked to make his examinations as complete as possible, this work should certainly be done; unwatering shafts and opening caved ground is usually a serious piece of work and should not be undertaken at their expense without the direct authorization of the client.

PERCY L. FEARN.

New York, October 14.

The Editor:

Sir—In reply to the letter dated September 18, 1907, from your correspondent T. S.:

1. We should say it is decidedly the better and more usual practice to charge a fee.

2. The answer to this question depends largely on circumstances. A letter written in England and stamped with a sixpenny Inland Revenue stamp, within the prescribed limit of time (a fortnight), is, we believe, as binding as a contract; but it is more advisable to have the terms of the agreement set out in the form of a proper legal document, and if the letter is from a company it should embody the terms of a minute passed at a properly constituted board meeting. It is questionable whether a telegram would constitute a binding contract; in any case, it would be very difficult to define the scope of the contract in this way, and you would naturally require to be certain of the good faith and financial stability of the sender of the message.

3. Yes. A lump sum is often asked, and paid by the employers to cover expenses of the trip.

4. This depends on the nature of the contract, but the engineer is, in our opinion, certainly entitled to charge for all labor and equipment necessary for carrying out the work thoroughly.

5. (a) We should not consider laundry bills and tobacco as legitimate expense items. Reasonable tips would probably be allowed. Also ammunition and medicine, if there was any occasion to employ them. A proper account should be kept and handed in, and the various items would then be passed or struck out.

(b) This, again, may be a matter of arrangement, but the engineer would expect, if acting alone or in charge of an expedition, to be allowed a first-class passage and the best accommodation at hotels.

(c) He has certainly no right to travel second-class or steerage, if paid to travel first-class.

(d) The account should be kept as minutely as possible, but may be summarized for presentation. If properly kept, there need be no charge for incidentals, and any items that might be questioned should be shown.

(e) Certainly we think that vouchers should be obtained whenever possible.

(f) Under exceptional circumstances, expenses incurred in entertainments might be permissible, but it would have to be shown that it was on the employer's behalf.

(g) The statement of account would generally be presented when the work is completed, but this, again, is subject to arrangement.

6. We do not think it is a good plan to forestall the final report by sending it in installments. The contract should leave the engineer a free hand in this matter.

7. We should say "Certainly not" to these questions referring to transactions in the shares.

8. It is impossible to reconcile the dual position that the writer assumes and without a special arrangement, any work done on behalf of others, or the acquisition of property, or options over property on his own behalf, would be liable to severe criticism, and place him in a very false position, even if acting in perfectly good faith.

9. We see no objection to publication of general information about the district acquired during the engineer's visit. If the employers are not likely to suffer direct or

indirect injury thereby, they are not at all likely to object.

10. It is often impossible to form a definite opinion, and he may have to advise further development or run the risk of turning down a good property. With regard to the last question, it would in our opinion be necessary to obtain the authority for special work of the kind referred to.

CHARLETON, DICKINSON & Co.

London, October 18.

The Wild-Cats of Ontario.

The Editor:

Sir—In reference to your letter from Ontario that Law & Co., the promoters of the Blue Bird, Blue Bell, etc., had received a warning from the Attorney General of Ontario as to the illegality of the advertisements they are publishing broadcast in Canada and the United States, *The Canadian Mining Journal* might go further and expose what I would term the Ontario conspiracy.

This is a gigantic conspiracy among the people of Northern Ontario to spread, and pretend to believe, the false reports emanating from irresponsible prospectors and fortune hunters. Men whose names have been above reproach think nothing of spreading these perversions and of profiting thereby. I have known such people to show specimens of ore from the Western States as coming from Ontario, selling claims and stock on the misrepresentation. I have known at least two claims at Larder Lake that were sold on a sample of ore that originally came from outside of Ontario. In respect to Law & Co., it will be found that they have protected themselves by reports from irresponsible adventurers, and publish these reports as true, and the only way to get at them is to prove that these reports were known to be false. This should not be difficult.

This whole Northern Ontario excitement is based upon the surface richness of the territory immediately surrounding the town of Cobalt. I say the "surface" richness advisedly, because so far it has been proved to be at the surface or near the surface only, and in no mine at Cobalt has rich ore been found below 300 ft. The Tretheway stopped sinking at 100 ft. because the vein became poor; hundreds of feet of cross-cutting has been done with good results, for many blind veins occur in the Cobalt territory which can only be found by cross-cutting at a shallow depth. The Silver Queen gave up work below 75 ft., because the rich vein did not extend down to the 125-ft. level. They also have found blind veins of great richness by cross-cutting on the 75-ft. level. I am told that the O'Brien mine never took out ore below the 175-ft. level. The McKinley-Darragh workings are not below 150 ft., while the La Rose at 300 ft. is a closed book, because the ore gets poor below 200 feet.

While the Cobalt veins are very rich near the surface, and from all indications are not of any great depth, the Larder Lake veins of quartz are poor on the surface and probably poor in depth. Those I saw were both poor and very shallow, some giving out within 10 ft. of the surface, others, which I did not see, had shafts reported to be from 60 to 150 ft. deep, but low-grade. The reports of high assays I take to be fiction or the assays of samples that originally came from elsewhere. These irresponsible assays and reports are published in the Canadian papers with the intent to deceive, for the Canadians know well enough that the capital to develop their country must come from the States.

The point I wish to make is that reports of finds of mineral from Northern Ontario must be discredited altogether. Usually where there is smoke there is fire, but in this case one generally finds frost.

D. A.

New York, October 24.

Mining in Australasia.

Written for the MINING AND SCIENTIFIC PRESS
By H. L. WILKINSON.

During the past year mining has been extremely prosperous in Australasia, and a record has been made for the value of mineral production, as the following figures will show:

1896	£13,730,532	1902	£25,235,229
1897	16,042,383	1903	27,315,366
1898	18,223,335	1904	27,559,210
1899	24,857,809	1905	28,545,118
1900	24,103,329	1906	30,410,000
1901	24,972,007		

The figures include the value of coal, shale, limestone, and similar products that have been raised, but compared with the metallic production these are small.

It will thus be seen that the mineral production is slightly more than double what it was 10 years ago, and there has been an increase of about £1,500,000 over the figures of 1905. It is more than probable that notwithstanding a considerable decrease in the gold yield in the future, the mineral production for the year 1907 and afterward will show further growth.

Considering the various States of the Commonwealth and New Zealand individually, it is seen that New South Wales and West Australia are responsible for nearly half the total mineral production. The following figures will show the variations in production for the past few years:

	1898. £.	1900. £.	1902. £.	1904. £.	1906. £.
New South Wales.....	4,801,248	6,460,968	5,078,029	6,220,051	7,912,716
West Australia.....	3,999,382	6,179,612	8,094,580	8,621,585	7,931,187
Queensland.....	2,962,711	3,180,161	3,310,600	3,704,241	4,198,647
Victoria.....	3,466,772	3,380,244	3,294,934	3,420,136	3,382,581
Tasmania.....	1,070,894	1,676,166	1,658,996	1,499,418	2,257,147
South Australia.....	349,436	515,128	576,468	652,545	977,063
Australian Commonwealth.....	£16,650,443	£21,400,182	£22,013,607	£24,119,976	£26,659,341
New Zealand.....	1,572,892	2,703,147	3,221,622	3,439,234	3,750,000
Total.....	£18,223,335	£24,103,329	£25,235,229	£27,559,210	£30,410,000

The figures for New Zealand include about £500,000 of Kauri gum extracted from the earth each year.

If these figures be read with those included in the following table, which shows the value of production of the principal metals in each State, some idea can be formed as to the items which have particularly contributed toward the increase in metal production, and some deductions may be made in respect to the future of different parts of Australia from a mining point of view.

Analyzing these figures, and taking the various metals in the order of their importance, the decrease in gold can be seen in all the States; and unless some new field be

discovered in the unexplored parts of Australia, this decrease in yield must continue, and at a more rapid rate. It is only necessary to consider the condition of the principal mining regions of Australia, where working costs have been brought down to nearly a minimum, to ascertain that the gold mining industry is on the down grade, though it is not anticipated that there will be any great decrease for a considerable time on account of the wide distribution of the mines.

WESTERN AUSTRALIA.

Taking the districts in order of their importance, it is seen that Kalgoorlie, which in 1906 produced £4,000,000, has passed its zenith, as regards the annual gold yield, in value of ore reserves, and the prospect of new developments. As the working costs at the Kalgoorlie mines are now at their minimum, there does not now exist the large reserve that most districts possess while a lowering of the working costs is still possible.

The accompanying returns summarize the position of the principal mines at Kalgoorlie; these mines are responsible for nine-tenths of the yield from this district, and for one-half the yield of West Australia. As will be seen, the Kalgoorlie mines mentioned, together with the Great Fingall Consolidated and the Sons of Gwalia, were responsible in 1906 for £1,933,786 in dividends out of a total of £1,992,062 paid in West Australia. Further,

these mines, owing to their large production compared with the number of points of possible future development, are more subject to large variation in yield than a great number of the small mines that make up the balance of the yield of West Australia.

When it is considered that these figures relate to mines which have proved to be most persistent in the value and width of their ore in depth, it is apparent that the gold yield in this State promises to decrease largely; and as there have been no new finds within the past five years, there are no indications of other mines to take the place of those approaching exhaustion.

	New South Wales.		West Australia.		Queensland.		Victoria.	
	1904. £.	1906. £.	1904. £.	1906. £.	1904. £.	1906. £.	1904. £.	1906. £.
Gold.....	1,146,109	1,078,866	8,424,226	7,622,749	2,714,934	2,313,461	3,252,045	3,280,478
Copper.....	406,091	789,527	25,180	50,337	237,896	916,346		
Silver.....								
Lead.....	2,065,540	2,862,973	45,916	37,612	71,858	101,683	4,990	4,980
Zinc.....	161,548	292,806						
Tin.....	188,377	255,744	58,817	157,644	270,276	490,283	5,190	11,644
Coal.....	1,994,952	2,337,226	67,174	57,998	166,536	173,282	70,208	80,283
Other minerals.....	419,072	552,481	2,276	4,847	122,741	203,379	87,703	4,928
Totals.....	£2,220,051	£7,912,716	£8,623,585	£7,931,187	£3,704,241	£4,198,647	£3,420,050	£3,382,581
	Tasmania.		South Australia.		New Zealand.		Total Australasia.	
	1904. £.	1906. £.	1904. £.	1906. £.	1904. £.	1906. £.	1904. £.	1906. £.
Gold.....	280,015	254,963	123,648	108,707	1,987,507	2,261,918	17,928,478	16,928,145
Copper.....	507,066	934,924	432,062	713,570			1,658,206	3,434,694
Silver.....								
Lead.....	396,110	462,443	1,387	12,982	112,875	125,000	2,688,676	3,607,683
Zinc.....							161,548	292,806
Tin.....	275,738	557,266	27,085	36,907			845,483	1,509,488
Coal.....	29,878	44,962			826,207	850,000	3,154,955	3,543,751
Other minerals.....	10,611	2,589	68,362	74,897	512,651		1,323,456	1,353,031
Totals.....	£1,489,118	£2,257,147	£652,545	£977,063	£3,439,234	£3,750,000	£27,559,210	£30,410,000

In the item 'other minerals' the values stated are only approximate, and this accounts for any discrepancies in the totals. In the case of New Zealand, 'other minerals' include about £500,000 worth of Kauri gum annually. In the above table the year 1904 has been taken for comparison purposes, as the conditions appertaining to that year were more typical of the years previous to 1906 than those of the year 1905.

VICTORIA.

The State of next importance in the production of gold is Victoria, which has now produced 70,000,000 oz. gold since the discovery in 1851. Though the indications of a decreasing yield are not as obvious as in West Australia, yet the great depth to which mining has reached and the generally poor results, together with the exhaustion of the superficial deposits, point to conditions which the gold mining industry has not previously experienced, and which must have a detrimental effect on the future yield, or at any rate on the profits. This view is supported by the fact that during 1907 the yield for the first six months of the year is 50,000 oz. less than in the corresponding period in 1906. There are, however, great deposits of buried auriferous gravel all over the State, and the successful exploration of these 'deep leads' would give a great revival to mining and would entirely alter the future of the industry, as the quantities of this gravel is very great, and up to now they have been but little exploited. The dredging industry has given a new source of gold, and it is probable that the yield from dredges and hydraulic sluicing plants will increase. The following are the yields from dredges during the past few years: 1900, 25,026 oz.; 1902, 31,622 oz.; 1904, 52,732 oz.; 1906, 85,271 oz. The average grade of the gravel worked in 1906 was 2.36 gr. per cubic yard.

There is, however, not the same permanency of production that there is in Victoria, and the decrease in the gold yield, which has been going on since 1903, is likely to continue. The profits derived from gold mining will decrease at a more rapid rate, as the dividends were almost wholly contributed by a few mines at Charters Towers and Gympie, together with the Mount Morgan mine, which is rapidly turning into a copper proposition. The following statistics will show the relative positions of the principal mines during the years 1904 and 1906:

	1904.			1906.		
	Quartz crushed.	Yield.	Divi- dends.	Quartz crushed.	Yield.	Divi- dends.
Charters Towers.	Tons.	Oz.	£	Tons.	Oz.	£
Queen Cross Reef	31,738	79,686	220,000	7,254	6,716	.....
Brilliant Central	36,606	32,867	60,000	19,656	10,392	7,500
Brilliant Ex- tended	28,654	11,349	.....	47,428	19,626	37,500
Brilliant & St. George	28,350	45,650	70,200	19,662	31,626	14,400
Mills Day Dawn United	6,369	4,034	.....	44,062	35,902	75,000
Total	241,200	233,231	391,652	240,416	204,528	174,960
Gympie.						
No. 2 S. Great	52,852	49,935	113,400	64,883	27,994	37,800
Eastern	83,450	36,924	53,625	91,700	45,909	82,500
Scottish Gympie.						
S. Gillanmire	27,776	20,027	39,000	16,770	9,013	10,500
Monkland						
Total	211,264	150,809	239,857	215,680	108,053	177,554
Mount Morgan	232,062	129,434	150,000	280,718	136,048	150,000
Queensland total	791,702	639,151	831,966	713,342	544,636	609,312

THE LEADING MINES OF WESTERN AUSTRALIA.

The quantities of ore treated are in long tons, of 2,240 lb. The figures in this table are not exact, but are substantially correct.

Mine.	1902.				1906.				1907.			
	Ore crushed.	Gold yield.	Average per ton.	Dividends.	Market value, Dec., 1902.	Ore treated.	Gold yield.	Average per ton.	Dividends.	Dividends 6 months ending June 30, 1907.	Market value, June, 1907.	Total dividends to date.
	Tons.	Oz.	Oz.	£.	£.	Tons.	Oz.	Oz.	£.	£.	£.	£.
Great Boulder	104,831	166,517	1.59	218,750	1,755,000	149,994	130,755	0.87	263,000	131,250	2,012,500	2,513,050
Golden Horseshoe	116,293	192,572	1.63	270,000	2,175,000	243,619	152,718	0.63	240,000	90,000	1,875,000	2,355,000
Croya Brownhill	45,000	45,930	1.96	45,000	1,012,500	114,538	151,654	1.32	360,000	146,250	787,500	1,964,991
Ivanhoe	131,800	142,297	1.08	130,000	1,400,000	185,967	122,603	0.66	240,000	120,000	1,475,000	1,748,750
Great Boulder Perseverance	140,573	193,240	1.37	390,000	647,000	151,062	65,538	0.43	105,000	35,000	385,000	1,251,250
Kalgoorlie	34,695	36,186	1.04	15,000	390,000	111,989	90,645	0.81	165,000	120,000	1,185,000	495,000
Associated Gold Mines	58,060	57,028	0.98	.....	681,125	94,643	72,638	0.76	49,536	.....	529,319	530,457
Lake View Consols	78,843	80,532	1.02	.....	875,000	117,755	42,241	0.36	17,500	.....	171,875	1,378,750
South Kalgoorlie	32,210	31,058	0.96	.....	175,000	88,167	38,392	0.44	40,000	10,000	125,000	50,000
Associated N. Blocks	12,038	55,895	4.64	87,500	437,500	36,881	40,128	1.09	87,500	52,500	.....	490,000
Total	754,286	1,001,311	.....	£1,116,250	£9,648,125	1,244,615	907,312	.....	£1,577,536	£605,000	£8,546,194	£12,767,248
Great Fingall	75,939	124,680	1.64	£143,750	£1,500,000	223,292	121,537	0.55	£275,000	£68,750	£468,750	£1,475,000
Sons of Gwalla	94,663	64,210	0.67	.....	162,500	121,680	55,768	0.45	£181,250	£32,500	406,250	425,675
Total for West Australia	.....	1,871,037	.....	£1,424,222	.....	.....	1,736,295	.....	£1,992,062	£847,458	.....	.....

The statistics of yields and profits from the gold mines of the various districts are as follows:

District.	1904.				1906.			
	Alluvial gold.	Vein gold.	Av. per ton.	Total dividends.	Alluvial gold.	Vein gold.	Av. per ton.	Total dividends.
	Oz.	Oz.	Dwt.	£	Oz.	Oz.	Dwt.	£
Bendigo	12,745	230,134	10.1	382,321	9,269	211,916	8.8	251,727
Ballarat	44,712	104,290	6.0	77,315	51,851	112,184	5.3	62,700
Beechworth	8,083	37,502	15.1	57,510	103,514	31,297	10.2	85,598
Ararat	13,085	11,458	5.9	10,166	8,638	16,260	5.1	.....
Maryborough	41,785	43,368	7.3	37,000	38,594	46,672	5.1	10,069
Castlemaine	26,890	50,309	9.5	17,240	32,990	66,396	12.8	37,701
Gippsland	6,820	59,900	21.9	41,841	8,777	88,402	18.6	36,896
Total	231,092	536,929	.....	623,397	253,696	568,130	.....	481,793

The average per ton refers only to the lode ore treated.

QUEENSLAND.

What has been said in respect to gold mining in Victoria applies equally well to Queensland, as the two States have similar characteristics in their mines and methods.

The other districts produced under 100,000 oz. gold per annum; of which Croydon and Ravenswood produced 80,000 oz. These figures are slightly on the increase, but not to any notable extent. However, with the completion of the railway extensions now under construction, the yield from the outside fields will increase, but it is unlikely that this increase will compensate for the decrease which must take place in the old districts with the exhaustion of the principal mines at Charters Towers and Gympie.

SOUTH AUSTRALIA AND TASMANIA.

The States of South Australia and Tasmania are unimportant in their gold production, and were responsible for yields of only £85,000 and £251,963, respectively.

The principal contributor in Tasmania was the Mount Lyell Co., where gold to the extent of between 1 and 2 dwt. per ton of ore is recovered in the copper smelting. The Tasmania, at Beaconsfield, which is an isolated mine, has recently improved its plant, and notwith-

standing having to raise 4,000,000 gal. of water per day for a lift of 2,000 ft., is once more producing gold profitably. The Mount Lyell and Tasmania yielded about 25,000 and 30,000 oz. respectively, in 1906.

NEW ZEALAND.

The total value of gold won in New Zealand during the past six years is as follows:

1901.....	£1,753,783	1903.....	£2,037,831	1905.....	£2,093,936
1902.....	1,951,433	1904.....	1,987,501	1906.....	2,284,918
Total since discovery of gold in 1857, £69,495,502.					

From these figures it is seen that in 1906 the rate of increase has been more than maintained. There is, however, every probability of this increase being halted, as the gravel deposits now being dredged are becoming exhausted.

The number of dredging plants at work in New Zealand is now 172. This is a slight decrease on previous years, due no doubt to the stoppage of a number that commenced work during the dredging boom between 1895 and 1900. In 1895 there were only 74 dredges at work.

Vein mining is practically confined to the North Island, where the Waihi and Talisman Consolidated contributed the greater part of the output of gold.

NEW SOUTH WALES.

This State is maintaining the yield it has been keeping up for the past 13 years, and there is every probability that for some considerable time the annual yield will be well maintained. This satisfactory position is due to the wide distribution of production. These conditions have rather tended to delay the prospecting of the country, for the concentration of mines in one or two districts encourages rapid development. For these reasons the gold mines of New South Wales are much younger than those of Victoria and Queensland, and speaking generally, the yield is more likely to be maintained.

The principal gold producing district is Cobar, which produced 60,463 oz. in 1906. At Cobar most of the large gold veins become copper-bearing in depth, with a considerable loss in gold contents. There are several large mines, however, without a trace of copper. The most productive of these is the Mt. Boppy, which produced 29,983 oz. This mine has large reserves, and it is likely to maintain the present output. On account of the unprospected state of the country in the vicinity of Cobar, there is every probability of new gold discoveries. The Mount Boppy mine itself was found only seven years ago, and has already produced £456,571, though no ore has as yet been taken out below the 300-ft. level.

As the Waihi is one of the greatest mines in the world, and has the most assured future of any gold mine in Australia, the following statistics may be of interest:

	Treated.	Yield.	Value per ton.	Profit.
	Tons.	£	Shillings.	£
To Dec. 1891.....	Not known	70,086	.....	.....
1895.....	33,670	120,335	71.5	85,506
1900.....	112,012	317,902	56.5	163,511
1905.....	266,515	728,521	54.5	346,554
1906.....	203,630	837,927	57.0	397,244
Total.....	.....	£5,111,628	.....	£2,442,708

The Talisman Consolidated and the Progress mines at Reefton, in the South Island, are the other two large mines in New Zealand. The following are particulars of the yield of the Talisman Consolidated:

	Treated.	Yield.	Average per ton.
	Tons.	£	Shillings.
1905.....	45,520	145,777	64
1906.....	46,417	160,119	63

The gold dredging industry in this State was responsi-

ble for 33,218 oz., and there is every probability of this yield being maintained.

The Progress mines at Reefton produce about £100,000 annually, at a profit of £30,000.

MILD STEEL has a rather definite elastic limit and yield-point beyond which the character of its action changes in a marked way. Beyond the yield-point the rate of stretch in tension becomes almost at once one hundred or more times as much as it was within the elastic limit. In compression, the ultimate strength of mild steel is not far beyond its elastic limit. It is evident that a structure made up of this material will distort and fail when a load producing stresses not much greater than the elastic limit is placed upon it. The elastic limit of mild steel has a small range, its value running from 50 to 65% of the ultimate strength, depending upon the size of the piece, method of rolling, etc., and the steel is made under such conditions that little risk is taken in choosing a value for a particular size and shape of piece. The modulus of elasticity of steel is also quite uniform. It may be said then, that the properties of this material, with proper inspection, are fairly definitely known. When the factor of safety of a structure is based upon ultimate strength of mild steel, it assumed that the factor of safety named in the calculations is nearly double the factor which will bring actual failure under the conditions assumed to exist in the structure. For a plastic material, or a material not having a definite elastic limit, or at any rate one for which the stress varies directly as the deformation for at best only a small part of the ultimate strength of the material, a different consideration must be given. For such materials, the effect of lack of uniformity of the material, the effect of increased deformation, of repetitive loading, of time, and of other factors must be considered.

IN the rooms of the Commercial Club at Grants Pass, Oregon, there is exhibited a large Indian mortar found at a depth of 58 ft. in a gravel-bank worked by the Deep Gravel Mining Co., of Waldo, Oregon. This mortar is quite similar to those in use among the Indians when white men first came to southern Oregon. Near the mortar is also exhibited a flat stone, about 3 in. thick and 12 or 14 in. diam., having a broad shallow depression in the centre of it. This was found at the same hydraulic mine at a depth of 51 ft. At the time of discovery eight flakes of gold were found ground into the pores of this stone. It is supposed that the Indians pulverized gold-bearing quartz upon this stone in order to separate the gold from the quartz. Whether the Indians used such an implement merely in treating the gold-bearing quartz they found in streams or used it in treating gold quartz that they had mined, is not indicated. But, owing to the many rich pockets of gold-bearing quartz found at surface in the hills of southern Oregon, it seems quite probable that the latter use was made of this stone. Besides, the stone appears to have been much used, and that would not have been so probable if only quartz-bearing nuggets were pounded on this stone. If such was the use of the stone, the writer suggests this is the first indication of quartz mining in the United States.

DIRECT current electricity is generally used about mines. This is partly because of the fact that alternating machinery was not well developed when electricity was introduced in mines; besides, electricity is generally developed at or near the mine and consequently direct current is used. But the rapid increase in the efficiency of long power transmission has caused the adoption of much alternating machinery about mines.

A Make-Shift Stamp-Mill.

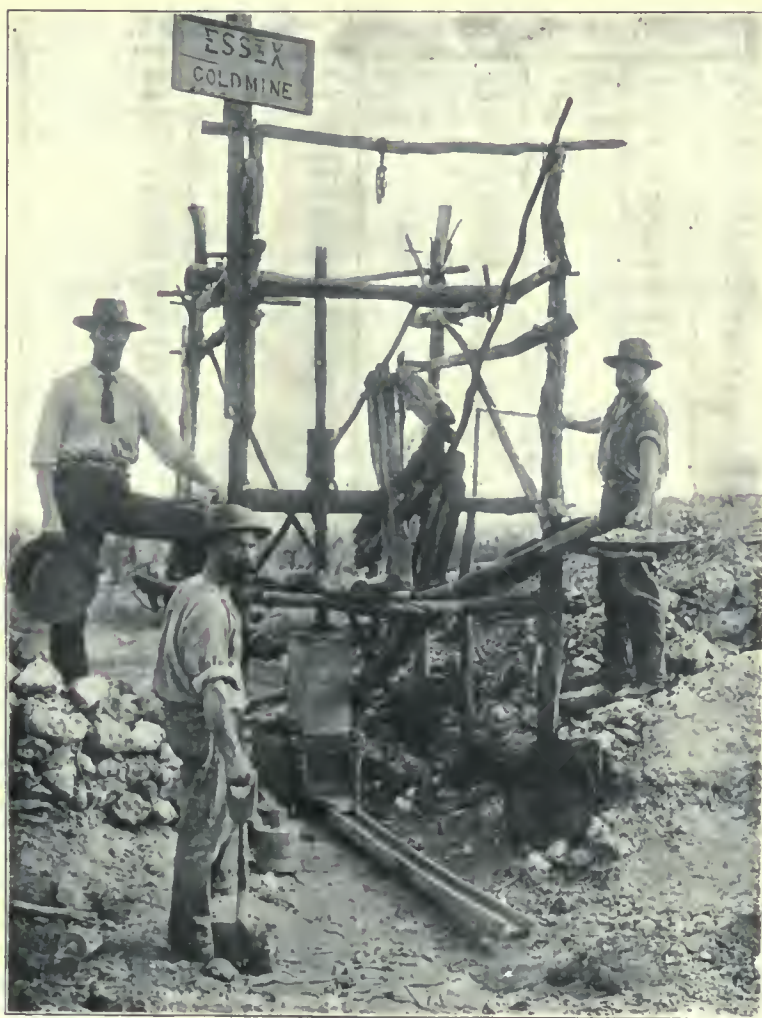
The accompanying photograph illustrates the resourcefulness of the Australian prospector. It shows a rough-and-ready stamp erected in the desert region of Western Australia. A windlass handle turns a round timber to which cross-pieces are fixed so as to serve as a fly-wheel. A piece of bent corrugated iron serves as a chute to feed the extemporized mortar. The frame-work looks a bit rough but it is the best available in the locality, where the only timber is obtained from scrubby trees of the acacia family. This photograph is one of the few things that escaped the San Francisco fire; the description that was prepared to accompany it was burnt.

ALCHEMY.—The writings of the alchemists were very numerous, and very mystical, and the recipes are quite unintelligible. Yet the evidence of successful transmutation, presented by the various writers, is overwhelming; and the writers appear to be themselves convinced of its reliability. There were certain facts known to them which gave some actual support to the possibility of transmutation; the deposition of copper on articles of iron left in certain mine waters, and the corrosion of copper into yellow brass on heating it with calamine and charcoal—both these phenomena were known to the ancient alchemist. Later came the knowledge that bronze could be formed from heating copper with cassiterite and charcoal, and there are records to show that the alchemist was familiar with such processes as the whitening of copper by arsenic, the cupelling of lead, whereby the globule of silver or gold was left behind, or the obtaining of precious metals by the distillation of the mercury which contained them. These facts had the appearance of actual transmutation, and many crafty knaves took advantage of the credulity of the times. Nevertheless, much chemical knowledge was accumulated during those centuries; metallurgy advanced, and pharmaceutical chemistry profited greatly. In Egypt, the mother-land of alchemy, during the early centuries of the Christian era, alchemistic doctrines were propagated by the University of Alexandria. These doctrines were absorbed and cultivated to a marvelous degree by the Arabians, who over-ran Egypt in the seventh century, and finally during the Middle Ages penetrated to France, Italy,

Germany, and England, and held sway even to the sixteenth century. The object of the alchemists was to convert the base metals into silver and gold—to 'enoble' the base metals. Hence there was a good deal of mystery attached to the art, and the word 'chemistry' today still preserves some of its early significance. Cham or chemi, the name of Egypt, may also be translated to mean 'black,' and we therefore have the 'Egyptian Science' or 'black art.'—Charles F. Chandler.

The Prospector.

Enquiries sent to this department are answered free of charge, if submitted by subscribers who are not in arrears. The full name and post-office address of the sender must be given, otherwise no answer will be made. Those who are not subscribers must accompany their questions with a fee of \$3 for each question. No assays are made.



A Make-shift Stamp-Mill.

Specimens sent by A. M. F., of Sierra Mojada, Mex., have not been received.

F. L. S., of Spokane, Wash., sends a specimen of black Tourmaline in radiating branches, with Magnetite grains.

A specimen of quartz-garnet rock with oxidized pyrite and chalcopryite was received from J. C., Fairview, Nevada.

W. S. L., of Silver Peak, Nev., sends: No. 1, massive Barite; No. 2, impure Barite with Limonite; No. 3, black Calcite.

C. H. W., of Grizzly Flats, Cal., sends: No. 1 and 2, compact Mica-Chlorite Gneiss or Schist; No. 3, rock decomposed into clay.

Three specimens, marked A. B. C.,

are: A, Quartzite with manganese stain and Rhodonite; B, Serpentine with native copper; C, Diabase with native copper.

The rocks from F. G. W., of Denver, Colo., are: No. 1, Feldspar-Porphry; No. 2, Rhyolite, somewhat chloritized; No. 3, Quartz-Porphry; No. 4, Diorite.

Specimens from Whitebird, Ida., marked E. W. S., are: No. 1, Serpentine; No. 2, Basaltic Dike with native copper; No. 3, Talcose rock stained by the red oxide of iron.

Specimens marked A. B. C., from Battle Mountain, Nev., are: No. 1, Rhyolite; No. 2, Metamorphic rock, serpentinized; No. 3, Quartz-Porphry; No. 4, Hornblende-syenite.

Weight of Water per Cubic Foot.

Contributed to the Mining and Scientific Press
By C. D. DEMOND.

The accompanying table has the merit of affording data to temperatures above 212° F, the point at which the ordinary tables stop. It is, therefore, especially useful in

TIMBER IN ECUADOR.—Ecuador's timber resources are not considered superabundant. The better classes of wood, the kinds and qualities most desired for local building and construction purposes, are found in limited quantities, being too scattered, when found in accessible districts, to encourage the building of sawmills for the purpose of exploiting such districts and building up any-

WEIGHT OF WATER PER CUBIC FOOT

Calculated from the following data:—

$$Sp. Gr. = 1 - \frac{(t-4)^2}{(94.1+t)(703.51-t) \cdot 1.9}$$

t = °C

1 cu. dm. water at 4°C weighs 999.96 grams
1 cu. ft. = 28.3170 cu. dm.
1 kilo = 2.20462 lbs.

Authorities:—Mendeleeff's "Principles of Chemistry" Vol. I, page 50.
Hering's "Conversion Tables" Pages 45, 49 and 50

Temp °Fahr	Lbs. per Cubic Foot	Temp °Fahr	Lbs. per Cubic Foot	Temp °Fahr	Lbs. per Cubic Foot	Temp °Fahr	Lbs. per Cubic Foot	Temp °Fahr	Lbs. per Cubic Foot	Temp °Fahr	Lbs. per Cubic Foot
32	62.42	91	62.11	151	61.18	211	59.87	271	58.22	331	56.25
33	.42	92	.09	152	.17	212	.84	272	.19	332	.22
34	.42	93	.08	153	.15	213	.82	273	.16	333	.18
35	.42	94	.07	154	.13	214	.79	274	.13	334	.15
36	.42	95	.06	155	.11	215	.77	275	.10	335	.11
37	.42	96	.05	156	.09	216	.74	276	.07	336	.07
38	.43	97	.04	157	.07	217	.72	277	.04	337	.04
39	.43	98	.02	158	.05	218	.69	278	.00	338	.00
40	.43	99	.01	159	.03	219	.67	279	57.97	339	55.95
		100	.00	160	.01	220	.64	280	.94	340	.93
41	62.43	101	61.99	161	60.99	221	59.61	281	57.91	341	55.89
42	.42	102	.97	162	.97	222	.59	282	.88	342	.86
43	.42	103	.96	163	.95	223	.56	283	.85	343	.82
44	.42	104	.95	164	.93	224	.54	284	.82	344	.78
45	.42	105	.93	165	.91	225	.51	285	.79	345	.75
46	.42	106	.92	166	.89	226	.48	286	.76	346	.71
47	.42	107	.91	167	.87	227	.46	287	.73	347	.67
48	.42	108	.89	168	.85	228	.43	288	.69	348	.63
49	.41	109	.88	169	.83	229	.40	289	.66	349	.60
50	.41	110	.87	170	.81	230	.38	290	.63	350	.56
51	62.44	111	61.85	171	60.78	231	59.35	291	57.60	351	55.52
52	.40	112	.84	172	.76	232	.33	292	.67	352	.48
53	.40	113	.82	173	.74	233	.30	293	.63	353	.45
54	.39	114	.81	174	.72	234	.27	294	.60	354	.41
55	.39	115	.79	175	.70	235	.24	295	.57	355	.37
56	.39	116	.78	176	.68	236	.22	296	.54	356	.33
57	.38	117	.76	177	.66	237	.19	297	.51	357	.29
58	.38	118	.75	178	.63	238	.16	298	.47	358	.26
59	.37	119	.73	179	.61	239	.14	299	.44	359	.22
60	.37	120	.72	180	.59	240	.11	300	.41	360	.18
61	62.36	121	61.70	181	60.57	241	59.08	301	57.28	361	55.14
62	.36	122	.69	182	.55	242	.06	302	.39	362	.10
63	.35	123	.67	183	.53	243	.03	303	.36	363	.07
64	.34	124	.66	184	.50	244	.00	304	.33	364	.03
65	.34	125	.64	185	.48	245	58.97	305	.31	365	54.99
66	.33	126	.62	186	.46	246	.94	306	.28	366	.85
67	.33	127	.61	187	.44	247	.91	307	.25	367	.81
68	.32	128	.59	188	.41	248	.88	308	.22	368	.77
69	.31	129	.58	189	.39	249	.86	309	.19	369	.73
70	.30	130	.56	190	.37	250	.83	310	56.98	370	54.75
71	62.30	131	61.54	191	60.34	251	58.80	311	56.94	371	54.71
72	.29	132	.52	192	.32	252	.77	312	.91	372	.71
73	.28	133	.51	193	.30	253	.75	313	.88	373	.67
74	.27	134	.49	194	.27	254	.72	314	.84	374	.63
75	.26	135	.47	195	.25	255	.69	315	.81	375	.60
76	.26	136	.46	196	.23	256	.66	316	.77	376	.56
77	.25	137	.44	197	.21	257	.63	317	.74	377	.52
78	.24	138	.42	198	.18	258	.60	318	.71	378	.48
79	.23	139	.40	199	.16	259	.57	319	.67	379	.44
80	.22	140	.39	200	.13	260	.54	320	.64	380	.40
81	62.21	141	61.37	201	60.11	261	58.51	321	56.69	381	54.31
82	.20	142	.35	202	.09	262	.49	322	.61	382	.37
83	.19	143	.33	203	.06	263	.46	323	.58	383	.33
84	.18	144	.31	204	.04	264	.43	324	.55	384	.29
85	.17	145	.30	205	.01	265	.40	325	.52	385	.25
86	.16	146	.28	206	59.99	266	.37	326	.49	386	.21
87	.15	147	.26	207	.96	267	.34	327	.46	387	.17
88	.14	148	.24	208	.94	268	.31	328	.43	388	.13
89	.13	149	.22	209	.91	269	.28	329	.40	389	.09
90	.12	150	.20	210	.89	270	.25	330	.37	390	.05

The above takes no account of the compressibility of water. Under the conditions in a steam boiler this is only 0.005 % per atmosphere, which is less than the error in determining the water content.

determining the weight of water in a boiler under steam. The figures for temperatures below the ordinary boiling point hardly differ from those given in other tables.

THE feverish haste attending leasing in rich ore is well exemplified at Goldfield. Boilers, hoisting engines, and head-frames have in certain cases been erected in the short space of two weeks. Owing to the present difficulty in disposing of ore to the smelters, Goldfield lessees have been forced to either build new ore-bins or to construct platforms on which to pile the ore as they mine it.

thing like a paying industry. It is said that east of the Andes Mtn., and in other inaccessible districts in Ecuador, good grades of various kinds of timber are found in abundance, but until some means of transportation is provided these vast forests will remain practically untouched. The names of the most useful and desirable woods found in this region are roble, figueroa, guayacan, mangle, laurel, balsamo, palo de vaca, pechiche, guachapeli, amarillo, moral, caracoli, cedro, algarrobo, and madera negra. For the frames of buildings guayacan, roble, mangle, guachapeli, and figueroa are used.

Economy of Power in Crushing Ore.

Written for the MINING AND SCIENTIFIC PRESS
By ERNEST A. HERSAM.

This article is intended to direct a more general attention to some of the principles that underlie economy in ore-crushing and pulverization. It is not so much intended to present anything radically new; the purpose is rather to indicate, in a plain sort of way, the direction that progress is taking, and to throw emphasis upon some of the principles that seem to lead most directly to the greater economy of the future. As industry grows, so the pulverization of rock becomes more important. The extent of such work must be dictated by the markets, but in producing the result it is well to be sure that we have advanced the standard as far as it will go to the frontier of the unknown. We cannot judge our present practice entirely by the profit won.

It is important to distinguish between that part of the work that is necessary, and that part in which power is lost as friction and in other ways.

The energy consumed in crushing, though apparently an unavoidable constant, is variable. This is not due entirely to a difference in hardness of the rock. Hardness, it is true, represents the resistant quality against which the forces must be directed, but there are other qualities of the ore and conditions of doing the work that so influence the results as to make hardness a subordinate feature. Lamination, crystallization, and many other physical characteristics may have so pronounced an influence as to render misleading a comparison based on hardness alone. Identical minerals show variable properties as they occur under different conditions; and a given ore of a certain place may be entirely unlike an ore of the same name known elsewhere. When a soft mineral occurs closely associated with a hard one, the soft mineral, even though present in but small amount, offers a line of less resistance to crushing, and the fracture, passing through the soft mineral, leaves uncrushed the hard constituents until the size is made so small as to require also the reduction of the hard particles. Thus coarse crushing may be done easily, sometimes, whereas positive and uniform fine crushing may require much more than a proportionate expenditure of energy.

The size of the fragments before they are crushed, compared with the size of the particles produced by the process, is, of course, in crushing, the measure of the useful work accomplished. The type of machine used, however, and the way of using it, has much to do with the power actually consumed. The energy required is in no case easy to predict definitely, nor is it at once learned by ordinary means of measurement. Some of the power is wasted. Only a part can be positively accounted for; and the part that has produced some telling effect can be learned only by paying attention to the variety of sizes in the particles of the product, and going into matters of measurement in a way that practical needs and immediate purposes rarely permit.

The total power required to crush and pulverize ore increases rapidly as the size is made smaller. Sizes often are expressed in maximum diametrical measurement, as determined by sifting; and to crush a ton of quarter-inch ore, for example, to an eighth-inch size, requires much more power than to crush the same ore, if of half-inch size, to a quarter-inch size—the diameter, however, in either case, being reduced one-half. Power thus becomes a heavy item of cost when a process requires an extreme pulverization of the ore, and this becomes prohibitory with a low-grade ore where power is costly. A small amount of fine dust is found present in any crushed product. This is more serious than is realized. Not

only is the fine ore found unsatisfactory for some subsequent process, but in producing it power has been wasted.

Some of the energy is lost in doing useless work, in crushing and pulverizing, despite every precaution. Friction between the particles of ore, and in the bearings of the machine, and a general loss of power in transmission all along, claim a share of the power. The ore deforms under stress, and this consumes power. Though the simple work of breaking the fragments apart is the only purpose sought, this work of deformation cannot be avoided and must be done before the rupture of the fragments begins.

The force resistant to crushing is simply the cohesion of the mineral; but to overcome this force effectually, sufficient energy must be expended to do, not only this one thing, but additional work as well. The forces are badly directed for a purpose so definite. Instead of pulling the fragments asunder, our machinery squeezes them the harder to break them; and we are obliged to trust the forces, somehow, to find their way around to break whatever rock they can. Machinery is not capable of handling the pieces separately. No frictionless device can cut each piece in two and give to each the measured touch to fracture it. Shearing becomes confused with compression; compression in part becomes tension; and crushing becomes an indefinite action in which only certain resultant forces prevail.

In the jaws of an ordinary type of rock-breaker, the small fragments of ore that result from the first of the thrust, becoming packed and compressed, are not at once disengaged. These are not in condition to receive further pressure until released and re-arranged. The ore so enclosed—pulverized, but retained—under the increasing pressure of the approaching surfaces, instead of being crushed, is partly rubbed and displaced along lines of less resistance. Many pieces of the ore, moderately fine, are in contact; and rubbing upon one another, they become merely abraded; and in doing so they consume energy by producing dust and heat from the friction.

In order to see more clearly the manner in which the power becomes distributed and finally consumed, it is best to consider separately the different directions in which it may go. All the real losses sooner or later appear in the calorific form of heat, unwanted and perhaps unrecognized. The power utilized, on the other hand, expended in overcoming the cohesion of the ore in breaking particles apart, is used in another way. This part is measurable as work done, not as heat lost, or some wasted form of energy, and this part of the power can be accounted for in the reduced size of the ore particles.

First among the general losses is the power lost as pure friction. Friction can be either in the machine, in the ore, or even, when regarded in a certain way, within the body of the single pieces of the ore itself, as a kind of plastic deformation. All these true frictional losses are encountered throughout. They extend from the shafting and belting, which convey power from the prime mover, to the ore itself at the moment of breaking. Thus, friction must be considered as unavoidable as any part of the work done, but it is a part that produces no desired effect, and first indicates a lack of economy, due to improper construction or imperfect conditions.

The *second* cause of loss arises from power given out in vibration in the foundation and elsewhere around the machinery, in supports and hangers, and disappearing in many ways. This energy is scattered in every direction. Foundations themselves, in some cases, consume much power; and the constant vibration everywhere, from the

ground up to the dust-covered cobwebs on distant rafters, all are taking power to maintain the motion. Vibrations of other kinds than this, through the air as well as through the foundation and supports, take away a small part of the energy constantly. Were other more trifling losses to receive separate attention, there could be included sound waves, heat waves, air pulsations, and even light, electricity, and other forms of energy, resulting from an unstable position of the pieces of ore in the machine, or caused elsewhere, as by the jarring of supports and foundations. Such wasted forms of energy being in part the result of friction, and in part of impact, are found everywhere, where there is motion, from the shafting, bearings, and belting, to the mass of ore itself. For the most part, however, the losses occur within the ore that is undergoing crushing.

Third among the general losses, is that due to the unavoidable deformation of the ore. This is not precisely a part of the general friction. It is work done in the interior of the unbroken fragments, and is over and above that work which should be necessary to overcome mere cohesion of the molecules in producing an actual rupture of the particles. It is the way in which much power generally goes; and although in many cases it is a loss that can be much reduced by taking advantage of the natural conditions, there is no hope of avoiding it entirely.

Fourth among the general losses could be named that which results from producing dust or fine below the size sought. The extent to which this becomes serious depends upon the subsequent process of treatment. To a certain degree, the production of dust signifies actual work done, however fine the dust may be. It is often to be regarded as work done improperly, however, if not an entire waste of the power expended upon it.

Thus seen power suffers loss in many ways. Although the purpose is to produce the single effect of crushing, by overcoming the cohesion of the solid ore, removing the fractured pieces from the field of intense attraction, the actual thing done is something quite different, and the resistance encountered is greater than should be necessary for doing that one thing alone. The energy so distributed can be considered as follows:

ENERGY EXPENDED IN CRUSHING.

IN THE MACHINERY.

In transmission to the machine:

- Friction in the bearings.
- Friction in the flexible belts, drives, etc.
- Circulation and friction of air at all moving parts.
- Forms of energy other than heat, of minor importance (electricity, etc.).

In the machine and foundation:

- Friction in the bearings.
- Air-friction and circulation.
- Tremor and vibration through foundations.
- Forms of energy other than heat, of minor importance (sound, etc.).

UPON THE ORE.

Between the fragments.

- Friction, resulting in heat.
- Numerous minor losses (sound, light, etc.).

Within the fragments.

- Plastic deformation.
- Unrecovered elastic deformation.
- Breaking.
- Excessive breaking, producing dust.

The friction of the machinery depends in general upon the construction of the machine and the condition in which it is kept. On the whole it is relatively a small part of the entire loss. Crushing machinery is not dif-

ferent from other kinds in principle; the same loss of power could occur in conveying motion for any purpose. The loss, however, would be increased two or three times by bad management or neglect, or correspondingly reduced by care and careful construction. Matters that should not escape attention, but that are neglected sometimes in regions remote from supplies and inspection, are: Protection of bearings from dust, the use of suitable lubricants and of proper belting, the alignment of shafting, the wear of gearing, and the care of bearing parts. Correct construction in the beginning often saves much cost in the end, but no construction can withstand ill use or neglect.

There have been cases where a change of lubricants has reduced the loss of power 30%, although conditions had been supposed correct before. The change of temperature between winter and summer has its influence, and though the power lost in this way is too variable to state definitely, it is important if lubricants are not suited to the climate and the season. Whenever a bearing is running hot, it represents power wasted. To run bearings even perceptibly warm, and particularly in cold places, is too costly to go unnoticed. When machinery is first started it does not run easily. This is influenced by the nature of the lubricants, the load, the condition of the belting, the dust, the duration of a previous period of idleness, and other factors. In the mill at the University of California, a good idea of the requirements of the different parts of the shafting and the varied work of different machines was obtained by taking periodic readings of a Thomson recording watt-meter, measuring the electric power used.

With good construction and management the power lost through friction in the machinery may be made less than 10% of that expended in other ways. It is a visible loss many times, and is one evident to the mechanic.

The loss of power among the ore-particles is much greater. The actual loss is mostly in some form of friction; and this is multiplied by an improper use of a machine. It will be found in any case to vary greatly with different rates of speed and with different methods of feeding and operating. It appears in two forms, namely, pure friction, and molecular friction or deformation.

When the disturbances that give rise to pure friction are examined, they are found to be more than surface deep. Surface friction is accompanied by strain and deformation beneath the surface. This consumes power in the molecular re-arrangement which, if permanent, often manifests itself as heat that appears to come only from the surface action. The ore is constantly undergoing some kind of frictional loss, and some of this takes place in the interior of each piece before it actually breaks, while some is among pieces after rupture has occurred.

All such friction is lessened by a free discharge of the crushed ore as it becomes reduced to the size wanted. This condition is difficult to obtain. To crush ore, the masses must be retained between the approaching surfaces that administer the force; but while too great an amplitude in the motion of the pressure surfaces tends uselessly to compress the fragments, grinding these upon one another, and distributing the force in many directions, too little amplitude, on the other hand, fails to do more than deform some of the particles, and failing to break these, it wastes whatever energy is so expended. In a reciprocating jaw-crusher, at each revolution, whatever the amplitude, the jaws are certain to come to rest against the elastic strain of ore. The power must suffer loss each time the pressure is applied and released. Thus the loss in working would be most reduced by having exactly the right amplitude for the quantity of ore retained between the jaws at any one time, and by having

sufficient voids between the pieces to provide a place for the crushed particles to occupy as soon as produced. This can be done by making the size of the original pieces uniform and comes from sizing before crushing.

Deformation is in part the cause of surface effects. It is the adaptation of the ore, under stress, without breaking, to new positions, forced by the pressure. It is a great consumer of power, varying with different kinds of ore, different rates of speed, and according to other conditions. In the amount of power consumed by deformation, the time element plays an important part. Give the ore time and it will bend or yield appreciably in any direction, tending to remain in the shape that suits the pressure upon it. Strike it a smart blow, allowing it no time to do this, and it will break always, when the blow is sufficiently forcible to correspond with the size of the fragment.

Ore cannot be worked under pressure like a plastic mass, of course, but there is a tendency for it to do this, and it is this quality that consumes the power. When no longer able to endure compression the ore breaks, but before it does so, it takes up energy in the slight alteration of shape, and the power consumed is the greater for the very difficulty with which it yields. With plenty of time many kinds of rock would bend under stress, and even to a greater extent than brief tests would show them capable of doing. It would be illustrated in a much exaggerated way by warmed glass, or a stick of plastic wax, which gradually would yield without breaking, changing its shape, or bending double if necessary, to occupy a position of least strain. Strain the substance suddenly, however, and it breaks.

There is, to be sure, a limit to the possible shortness of duration, or practical rapidity of motion, for any material to adapt its molecular condition to new needs; and along with the time must be considered other important and obvious factors (the temperature and the pressure applied) but the deformation is in a great measure a question of time, and the elastic limit and breaking strength are in many ways dependent. The study of explosives and of blasting, a knowledge of projectiles and of the results produced by their impact, and even a study of the rapid impact pulverizers, all bring into the consideration a time factor.

Experiments to show the definite effect of speed in crushing have not been numerous. The advantage of high speed, however, has been shown in many cases. Much has been learned already by experiment regarding the viscosity of solids, but this is not so well correlated with what is known of the energy required to crush them. The possible practicable variation in velocity is small. The work can not be instantaneous and neither must it be prolonged. The economy in certain impact pulverizers, and the advantages of high speed in numerous other machines would make it desirable to know more definitely about the power that is consumed by viscosity, and to learn the difference between this and the loss through elasticity, and to know exactly the part consumed by the fracture of the ore. All that can be said now is that much additional total power is required in running slowly upon certain kinds of tough rock; but, on the other hand, brittle or highly elastic rocks show little compensation for the mechanical loss there is in high speed.

The importance of a correct velocity can be learned even by working with a hand-hammer. Selecting a hammer that is a little too heavy for use upon rock that is tough, a man finds it difficult to obtain a satisfactory return for his labor. The same rock with the sharp quick blow of a lighter hammer, in the hands of a man properly skilled, shows a different result. The difference

is not so much in the energy expended. It is in the speed of the blow. There must be a suitably high velocity to accord with the size of the fragment and the distance through which the rupture is made.

Tests of consumed power, measured by the effects, are difficult to make with precision. The measurement must be made upon irregular fragments of rock, and upon a crushed material in a form difficult to sort and measure. The product, like the original material, consists of particles of many different shapes and degrees of hardness. It is not easy even to learn what part of the power has been used in producing dust, distinguishing it from that lost as mere friction, because dust is difficult to collect, to size, and to measure. Each different size of particles represents the consumption of a definite proportion of the total power applied, but since each size must be calculated separately, it must be screened, collected, and considered by itself.

For some purposes all power that goes into the production of dust is lost. In other processes dust is of no injury, as long as all of it is recovered; and in some cases the production of dust may even be sought; but in any case, to learn of the hardness of the ore and the consumption of power upon it, the dust must be collected, and this must be sized, weighed, and calculated for the power it has consumed. Sometimes in rough crushing this dust may comprise two or three per cent by weight of the crushed product, and the power it has consumed is shown to be large when calculated according to its size and the surface it represents.

Besides the plastic deformation there is still another important form of deformation sometimes called elastic deformation, in which the ore alters and then again regains its shape. Ore does not retain or consume power in this respect that it does not again give back when the pressure is released. The return of the power, however, may come at such a retarded time or be in such a direction as to produce less effect than if the elastic deformation had not occurred, and this dispersion of force, rather than the resistance to the original pressure, is seen to be the real cause of loss of power. There is always the possibility of utilizing an important part of the power that expends itself upon elasticity. The energy is stored and exists as an elastic strain. It is unlike that which overcame plasticity, for this consumed power and produced heat in making a permanent change of shape, while elasticity produced but little heat, reserving the energy to be given out again in a kinetic form.

Simple inspection of working machines shows how this elasticity of the ore yields energy in an ineffective way. Consider the jaw-crusher, for example, or one of the gyratory types. In these machines the motion is relatively slow. Under this action, an elastic fragment such as a piece of quartz, is compressed more and more by the jaws of the machine until finally, unable longer to withstand the stress, it breaks. As it does so, the balanced forces in the elastic strain of the particle are upset suddenly, and the whole fragment flies into many pieces by the release of the first rupture, and work is done by the energy that was reserved in the elasticity of the rock.

The loss of power through elasticity will be seen to be different in the different types of machines and under the different velocities of operating. Some crushers minimize this loss. Others recover power from elastic strain, but are wasteful of the plastic deformation by their slowness of motion. All rapidly acting machines, as a rule, are economical as far as plastic deformation is concerned. With elastic deformation this may or may not hold true, as will be seen. Also in a comparison of grinding machines with crushing machines, the difference between elasticity and plasticity of the ore must be carefully

observed. True crushing devices are well suited to contend with elastic deformation, whereas they are not always best when the deformation is of the plastic kind. Thus impact pulverizers have their place, and rapid stamps, deriving their required impact from high velocity rather than through ponderous weight, are effective as crushers for certain kinds of ore. Higher speed in rolls and in all classes of crushers is desirable, up to the point where greater wear and heavier loss comes from the mechanical difficulties due to high speed. The tendency of improved construction has been to increase the speed. Better mechanism, improvements in bearings and means of lubrication, are making a speed possible now that once would have been considered impracticable.

In the stamp-battery it is seen how the work done upon elastic deformation is not well recovered. Whatever the depth of the ore upon the dies, or whatever the weight of the stamps, they are certain at each drop to come to rest against the elastic pressure of the ore. The rebound of the gravity stamps, with an interval of rest necessary for irregularities and contingencies is not recovered again. In rebounding the stamp does not acquire sufficient kinetic energy to be effective when dropping, nor does the rebound occur at a time favorable to aid in elevating the stamp, allowing the interval of rest necessary in a gravity stamp for the cam, with a slight variability in the power. Direct-acting steam-stamps make use of these forces by their rapid action, but in mills where battery amalgamation must be practiced these rapidly reciprocating appliances cannot be used to advantage.

Jaw-crushers gain somewhat by the elasticity, as against the plasticity, of ore; rolls and gyratory crushers also recover much of this elastic force. Tube-mills, *arastres*, and grinding machines, on the other hand, are not well devised to distinguish between the quality of elastic and of plastic deformation except in so far as the elastic deformation is accomplished by a quality of brittleness, or a narrow range within the elastic limit.

The Huntington and other centrifugal roller-mills are economical in this regard. By reason of their construction it is seen that the elastic reaction occurs at a time and in a direction to be effective in propagating a motion in a direction that aids the forward movement of the rollers, and in a manner to replace some of the power that would be necessary were plasticity, instead of elasticity, the restraining quality.

Friction within the ore is variable in different machines. All pulverizers in which the crushing surfaces, the jaws, liners, mullers, or moving parts slide over one another in place of approaching in a direction normal or perpendicular to their surfaces, fail to escape a heavy loss of power through friction and wear. It is necessary to distinguish between crushing action and grinding action by exactly this difference. A grinder is a machine which compresses the ore between surfaces moving tangentially or sliding over one another. A crusher compresses the ore between surfaces approaching normally or nearly so. Both effects, crushing and grinding, occur side by side to some extent, in all reducing machines, for it is not possible to direct a force into a mass of ore to produce motion without scattering the energy into a great variety of tangential displacements. In certain types of machines, however, the crushing feature is brought out as much as possible, and in others grinding predominates. In grinding machines the rupture of particles does not penetrate so much into the centres of the ore-pieces. In place of this, the tangential direction of motion, rubbing along the surface, or causing rotation of the particle, tends only to abrade the exterior, and in so doing tends to produce dust and waste power as friction.

Extremely fine pulverization requires these tangential devices in practical machines. With fine sizes the tangential motion is not so serious. Unevenness in the texture of a wearing surface furnishes innumerable places of lodgment opposed to the direction of motion. Such places are large in size compared with the size of the small particles, and their great number results in countless applications (in a small way) of local normal forces, which hold and break the small particles so as to simulate crushing. It may be said in favor of grinding action for fine sizes, that any attempt to pulverize ore finely in true crushing machines requires thicker layers of the pulverized masses to produce a satisfactory output at a reasonable speed, while within such masses a grinding effect is produced which the very principle seeks to avoid. True crushing practised upon fine sizes brings out more seriously the elasticity of the liners, since these crushing surfaces are exposed to a pressure that is intermittently applied. In principle, however, the effect of crushing and not of grinding is to be sought, and always this is desirable for the coarse sizes.

Tube-mills and ball-pulverizers, by their action, become for the most part types of grinding machines. When the construction or operation provides for a drop-action of the balls, pebbles, or unattached parts, so that in rotating, these fall upon one another, or upon the lining, then the crushing effect begins to appear. However, the elasticity of the pebbles, or the balls, or the elasticity of any substance used in the liners, limits the economy of the crushing principle applied to extremely fine sizes. When the size of the particles of ore is thus very small, then the force to overcome the elasticity of the pebbles or balls becomes relatively great and this elasticity consumes much power compared with the crushing work actually done upon the ore. The hardest and most resistant material that can be obtained, for this reason, is desirable in the construction of machines where ore must be reduced to fine sizes, and especially is this true where slight crushing action accompanies mere grinding.

The final, useful, and necessary part of the work of crushing is that of totally outstripping the force of cohesion of the molecules along the needed lines of fracture, overcoming by distance the attraction that exists in the uncrushed ore. This is the real work to be done. It is against the single quality of hardness that the energy is necessarily directed. The mineralogist's scale of hardness should show this relative factor; it is this quality that would exist if elasticity and viscosity could be disregarded.

While the energy that appears to be exhausted upon the hardness of the rock is varied, in practice, by deformation, which is nearly inseparable from hardness in its effects, there is a final and unavoidable residual cohesion, to overcome which causes rupture, and which is not subject to deformation within the short time-limits of breaking. The energy expended on hardness does not so much depend upon the principle of the machine nor the manner in which the work is done. It is dependent upon the fineness of crushing which represents the effect produced. It can be judged by comparing the size of the particles after crushing with the size before. The energy actually expended in producing this effect can be measured only by taking into account the friction and the deformation that accompanied the breaking under definite conditions.

The real work accomplished in crushing is thus measured by the extent of new surface made. It is desirable, many times, to measure this surface, and to learn by so doing how efficient any process of crushing has been. To measure the exact extent of such surface is not a simple operation. Nothing can be done more than to approxi-

mate it in various ways. Rittinger, Von Reytt, and others have found values in certain cases, but these, while difficult to obtain, have in the end been approximations depending upon certain estimates.

To judge the extent of the surface in a practical way, size the crushed product, and estimate the surface as a whole from the sizes of the screens and the average diameters of the particles. A certain relation exists between the average diameter of the particles, in a closely sized product, and the surface-area represented by such diameters. This relation can be taken as a constant under given conditions. The work done in producing the surface represented by these diameters may not always be identical for different rocks. It will vary according to the kind of machine used, but the work of producing new surface under like conditions in uniform material is necessarily proportionate to this surface and to average diameters.

The unit of work is some certain area of the new surface made, or, more properly, it bears a direct relation to the area of fracture, one square inch of which signifies the production of two square inches of surface which did not exist before the fracture. Such a unit of work, or unit of fracture, can be regarded, if necessary, as though it were united into a certain single large fracture through solid rock, or again, as though a definite volume of ore were reduced from one definite size to another definite size. Practically, rock cannot be cut evenly by fracture. In practice, too, there are found crystals comprising a large part if not all of the rock substance; and there are many irregular qualities, cleavage and seams, that bring out various planes of weakness not encountered until some definite degree of fineness is reached. These planes lead to different shapes of particles, and, in a great measure, are the cause of the different degrees of hardness shown at different sizes. Their effect, moreover, is shown upon the average hardness of the rock.

In dealing thus with irregular shapes and sizes, it is necessary to classify the particles, whatever their shape, by the screens that separate them. In so doing, the theoretical cube would be taken as the basis of the surface measurement. Particles that actually pass rectangular openings differ from the theoretical cube in one way or another. Natural crystals are generally so misshapen and fractured as to give no clue to averages by which surfaces might be estimated. Where, however, a prevailing shape of the particles is so well known and so constant as to make it safe to allow for this quality, a constant factor may be used. Thus the factor k , as will later appear, may be taken to represent the ratio between the surface of a mass of ore, when consisting of particles that would pass a given rectangular screen-opening, and of the same mass existing in such theoretical cubes as should exactly be capable of passing the same screen. Such a relation gives k a value between 1.2 and 1.7.

If a piece of rock, one cubic inch in size, be broken in two with a clean cut parallel with one of the faces, there are made two square inches of new rock surface, and there has been made a cut through the fragment of one square inch in area. This square inch of fracture through uniform substance may be taken as a unit of work, or more properly, a unit of result accomplished. To crush a cubic inch of ore into half-inch cubes would signify producing a fracture in three directions each of one square inch in area, through the one-inch cube. Such a reduction of size represents three square inches of new fracture made, and if a be understood to be the work of producing one square inch of fracture, then breaking a cube into half-inch cubes represents the work of $3a$. If k be taken as a factor expressing the relation between the surface of solids of known average shape to cubes of the

corresponding screen diameter, then $3ka$ is the work of breaking each cubic inch of irregular ore from a size that would pass a one-inch screen to a size that would pass a screen half that diameter. Thus ka , wherever k is constant and known, can be used in place of a , throughout the work.

Without careful sizing it would be difficult to learn how efficiently the work is done. It is too crude an approximation for any but the roughest purposes to learn only the power to crush a given weight of ore down to a certain size. The initial size is important; moreover, an important part of the crushed product could pass a screen much finer than the one stated. When seeking to obtain a product composed, for example, of one-inch pieces, often half or more of the product will pass a three-quarter-inch screen, a third, or more, will often pass a half-inch screen, and much might be even finer than this. Careful examination often shows two or three per cent of extremely fine dust, representing much more power than its amount would first suggest. However difficult it may be to collect and measure the dust produced, it should not be overlooked in estimating the actual work done.

Different kinds of rock act differently in this way. Different crushers produce different results in the uniformity of product and dust that is made. Tough rock, deforming under pressure, will tend toward a large proportion of the maximum sized particles. Brittle ore causes more than a corresponding quantity of fine. The work done, in every case, consists in producing this new surface, however fine the size of the crushed particles. Thus in measuring the hardness of a rock, or the efficiency of a machine, the undersizes can not be neglected.

Since $3a$, in which a is expressed in foot-pounds, represents the work of crushing a one-inch piece of ore to half-inch pieces, it is necessary to extend the expression to represent the work of crushing a larger body of ore consisting of particles of any definite size. This merely is a relation between diameter, surface, and mass; and the expression may be extended in the following way: A cube of ore, one inch in size, broken into any number of smaller but uniform cubes, necessarily will be cut by planes. There are three directions in which these planes will extend, in order to make cubes, making angles of 90° between planes; and in each one of these three directions there will be, not always one plane, but a system of parallel planes, the distance apart and the number of which depends upon the fineness of crushing. The number of parallel planes in any one of the three directions will be $n-1$ if n be taken as the number of pieces produced out of the linear dimension of the original piece. Thus cutting one-inch cubes into eighth-inch cubes makes $n=8$.

The total number of planes made by fracturing the one-inch cube into smaller cubes thus is $3(n-1)$ and each of these is one square inch in area. So when a represents the work of cutting through one square inch of rock, the work of fracturing a one-inch cube into smaller cubes is: $3a(n-1)$.

Applied to any cube, of any size, the value n , becomes D/a where D and a , respectively, are the diameters before and after the crushing. The fracture-planes now are of different area, since the single piece of ore is no longer of unit size. The area of the newly considered fracture-planes naturally will be D^2 , since D is the diameter of the piece in linear units. Thus making one cut through this different-size piece represents aD^2 , of work, instead of a , as in the unit piece, where D had a value 1. The formula applying to a cube of any size (a being the work

represented by a square inch of fracture) thus is seen to be:

$$3aD^2 \left(\frac{1}{d} - 1 \right).$$

The number of such original pieces (whether more than one or less) that could be made from the mass of a cubic inch of solid rock, or in other words, the number of cubical pieces per cubic inch is, $\frac{1}{D^3}$. Here, 1 is the unit of volume, and D^3 is the volume of any of the single particles produced from it. Thus the work per cubic inch becomes:

$$\frac{1}{D^3} \cdot 3aD^2 \cdot \left(\frac{1}{d} - 1 \right); \text{ or } 3a \left(\frac{1}{d} - \frac{1}{D} \right).$$

In such a problem, for example, as where a 20-hp. engine is crushing a certain output of ore, reducing it from a 2-in. size to a $\frac{1}{8}$ -in. size, and where it is required to estimate from this what power would be necessary to crush the same 2-in. to $\frac{1}{32}$ -in. size, instead of to the $\frac{1}{8}$ -in. size, the value $3a$ may be taken as a constant where the ore is uniform and the crushing appliance so adapted to its requirements as to be equally efficient. The problem then expressed by proportion is as follows:

$$20 : k :: 3a \left(\frac{1}{8} - \frac{1}{2} \right) : 3a \left(\frac{1}{32} - \frac{1}{2} \right).$$

In this case $x=84$.

When it is desired to show the power necessary to crush a given weight of ore, as a ton, or a certain number of tons, it then becomes necessary to take account of the specific gravity, S , of the ore, or the number of cubic inches of solid rock contained in a ton of ore, allowing a to stand for the work, in foot pounds, of producing a square inch of fracture. As there are 55,320 cubic inches in a ton of a substance (water) having a specific gravity of 1, there will be $\frac{55,320}{S}$ cu. in. of solid rock represented in a ton of ore. Thus the work of crushing a ton of ore, shown in work units, giving comparative values for a , would be:

$$\frac{55,320}{S} \cdot 3a \left(\frac{1}{d} - \frac{1}{D} \right) \text{ ft. lb. per ton.}$$

or:

$$\frac{55,320}{S} 3a \left(\frac{1}{d} - \frac{1}{D} \right) \text{ hp. hr. per ton.}$$

$33,000 \times 60$

Or simplifying:

$$a \left(\frac{0.08382}{S} \left(\frac{1}{d} - \frac{1}{D} \right) \right) \text{ hp. hr. per ton.}$$

The values of a that will be learned by a careful sizing test will be significant constants, showing the characteristics of the rock. The motion and principle of the machine influence the value of a . The size of the ore pieces giving greater or less opportunity for deformation shows variable effects. The crystalline character of certain rocks brings out different qualities which affect the value of a at different sizes. The speed of running has much effect and should be in accord with the size and quality of the ore. The value found for a , in any given case, makes a standard of comparison, for crushing the same ore to any other size, or in any other machine, and gives a figure that should be equalled or improved in further work upon the same ore, or the reason learned why this cannot be done.

Thus while a stands for a definite amount of work (1 sq. in. of fracture, in foot-pounds) with a given ore, it can not be taken as a constant without regard for the speed, the conditions of temperature and moisture, and many circumstances that influence the hardness or modify the efficiency. The friction and other losses properly

should not be included in the stated value of a . In practically representing it as a result of any test, the friction cannot be entirely eliminated nor the result accurately corrected to allow for it. Running a machine with no load is not an exact measure of the losses sustained in running the same machine while doing its work, and there are numerous other conditions, aside from friction, that have no proper units to express their values. The friction in the ore is dependent upon the mass of material. This is modified by the direction of forces, the amplitude of motion, and the brittleness or the toughness of the rock upsetting the relation that existed at the start. The lowest value for a , however, under the most favorable conditions that can be found, should be an approach to the absolute requirements of the crushing work.

Tests have been made in which ores of various kinds were used, in which the ore was crushed under a dropping stamp, of a known weight, falling through a measured distance, upon a definite quantity of a given ore, prepared and selected of a uniform size and placed in a specially made mortar to receive the single blow of the stamp, and then sized, weighed, and calculated; these tests, or some of them, show a gratifying constancy and give values of a which, for those ores, would seem an ideal to be sought in practice.

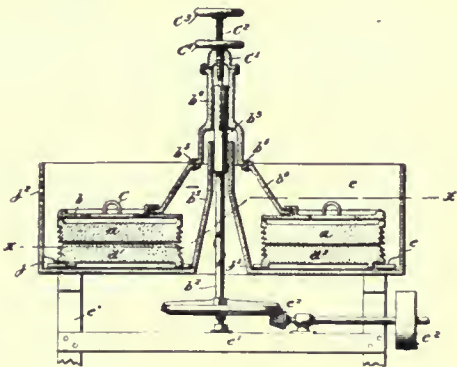
It is of interest to observe what values a may have for general ores. These vary so widely between soft rock and hard, and between different varieties of the same mineral, as it occurs in different lodes, that no one mineral can be taken as a standard of comparison. Each ore shows its own minimum value when the conditions for crushing it are made to accord with its needs. Values of a between 2 and 5 are not uncommon. To take some of the common practical estimates, if power is required at the rate of 1 hp. hr. per ton of ore, to crush from 6-in. size to the size of $2\frac{1}{2}$ in., assuming a specific gravity of 3, and regarding k as 1, a value of a is found to be 153. If 30% of the ore exactly passes a 1-in. opening, the remainder passing the $2\frac{1}{2}$ -in. opening as before, a has a value of 120; and if 10% of the whole passes a $\frac{1}{8}$ -in. opening, while 20% is of the 1-in. size, a has a value of 116. Similarly, if it require $6\frac{1}{2}$ hp. to crush a ton per hr. of $2\frac{1}{2}$ -in. ore to $\frac{1}{16}$ -in. size, producing no undersizes, a takes a value of 14.31. The undersizes depend upon the brittleness of the ore and the way in which the work is done. They are variable in amount in different ores, and they should not be approximated by estimates. The work done is often two or more times as great as would be indicated if the largest size were taken as a criterion of the size of the product, and the value of a correspondingly is much smaller than would be indicated if it were so considered. Thus in this latter case such a value as 7 for a might be expected when calculated upon sizes.

The attainment of fullest economy in crushing will be found in a speed that is sufficiently high for tough ore, an amplitude that is adequate for elastic ore, and from a moderation of both speed and amplitude for brittle ore. Whenever the reduction in size is intended to be great, the fine must be protected from further crushing either by water suspension, repeated sizing, or abundant opportunity for rearrangement of the compressed ore by the provision of interstitial space that accompanies uniform sizing. It depends upon producing the effect of crushing rather than of grinding, particularly upon coarse sizes; and of employing hard and non-elastic surfaces in contact with the ore. It demands solid foundations for machinery, care, cleanliness, and protection of bearings, tested lubricants, and the avoidance of all unnecessary irregularity of shape in high-speed running parts designed for the construction.

MINING AND METALLURGICAL PATENTS.

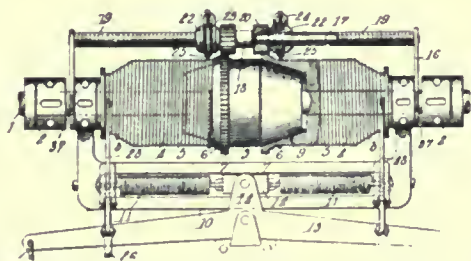
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SHOE AND DIE OF GRINDING-PANS.—No. 867,989; William Middleton and Hervie N. G. Cobbe, Kalgoorlie, Western Australia.



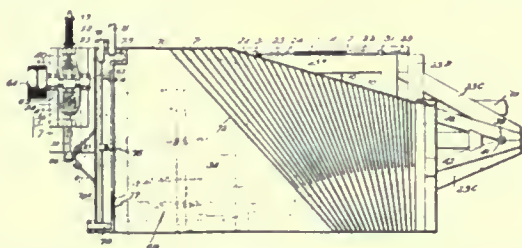
The combination with the muller plate having slots therein; of shoes having lugs thereon fitting into said slots, and having peripheral flanges that engage the under face of the muller plate and hold the shoes distanced therefrom, said shoes having spaces between them for the circulation of the material, the spaces between the flanges of adjacent shoes at all times being sufficient for the circulation of material to be ground, independent of the wear of the shoes.

HOIST.—No. 868,844; Charles O. Conner, Heppner, Oregon.



A hoist comprising a continuously rotating shaft having a clutch member fixed thereto, a drum mounted upon the shaft and adapted to move longitudinally to engage said clutch member, means for moving said drum, a catch mechanism for holding the drum in contact with the clutch, a tackle winding upon the drum and a catch-releasing mechanism carried by the drum and operated by the tackle.

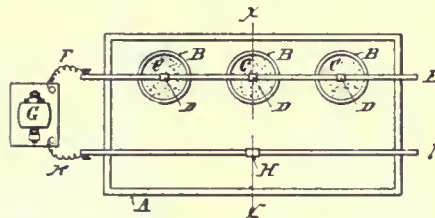
ORE-CONCENTRATOR.—No. 868,830; Joseph Algert, Denver, Colorado.



In a concentrator, the combination with a bed plate, a frame mounted on said bed plate, boxes secured at predetermined parts of said frame, said boxes being provided with a wedge-receiving recess extending transversely through them, and with a vertical recess intersecting said wedge recess, a wedge in said recess provided with a threaded stem at its small end adapted to extend through the wedge recess of said foot box, a clamping nut threaded to the stem of said wedge and arranged to bear against said foot box, a vertical sliding block on said vertical recess provided with a pivotal centre recess at its top end adapted to rest on said wedge, vertical rods provided with pointed ends supported at their lower ends in the pivotal recesses of the vertically sliding blocks of said foot blocks, a concen-

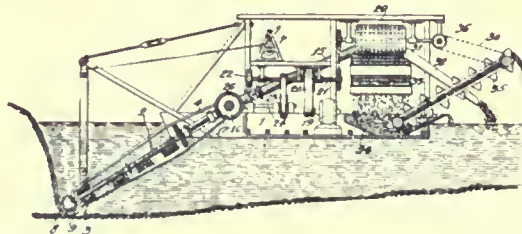
trating table supported by said rods and wedge blocks, a vertical shaft secured at one end to the discharge end of said table, a stud secured to said bed plate provided with a tapering point pivotally journaled in the lower end of said shaft, a socket plate secured to the under side of said table's supporting frame and provided with a pivotal recess adapted to journal the opposite or upper end of said table's vertical shaft, and means for oscillating said table on said vertical rods and said vertically journaled shaft.

PROCESS FOR THE RECOVERY OF NICKEL FROM ORE.—No. 868,769; Charles H. Ehrenfeld and Jacob R. Grove, York, Pennsylvania.



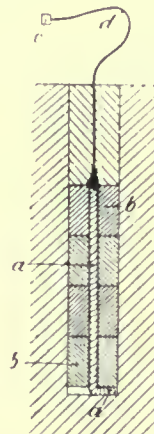
The process for the recovery of nickel from ore which consists in placing nickel ore within a jar of suitable porous material in operative proximity to an electric conductor within the jar; locating the jar thus charged as an anode in a bath of an aqueous solution of sulphuric acid and a salt of ammonia; locating a suitable cathode within the bath; energizing the circuit and thus recovering the metal.

DREDGING APPARATUS.—No. 868,774; Thomas R. Goth, San Francisco, California.



In a dredger, a rotary snail-shell-shaped digger or excavator having a single projecting cutting edge, and a single inlet opening. In a dredger, a rotary snail-shell-shaped digger in combination with a rotary pipe to which said digger is rigidly secured. In a dredger, a rotary snail-shell-shaped digger having a single inlet opening in combination with a rotary pipe to which said digger is rigidly secured. In a dredger, a submerged or partially submerged pipe, and rotary snail-shell-shaped digger at the extremity of said pipe, said digger having a single cutting edge and a single inlet opening in its periphery.

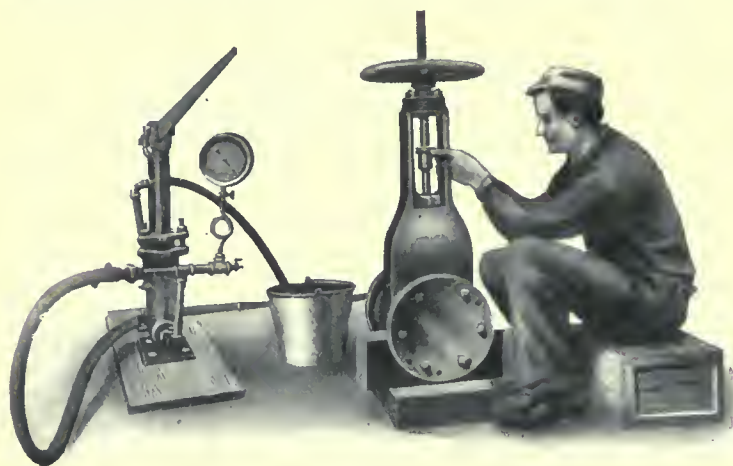
PRIMING OF EXPLOSIVES.—No. 868,876; Louis Lheure, Paris, France.



An improved primer consisting of a detonating fuse of small diameter embedded in the entire length of the charge and a separate detonator of suitable composition connected with the top end of the fuse by a fuse of smaller diameter, substantially as described and shown and for the purpose set forth.

Testing a Water-Gate.

Hydraulic engineers and mining men will be interested in an extraordinary test recently made at the Sunnyvale plant of the JOSHUA HENDY IRON WORKS upon a 7-in. discoidal high-pressure water-gate. The manufacturers being desirous of testing this, submitted it to an unusually severe trial, namely, that of packing it under high pressure. Selecting one from the stock just finished, the openings were blocked with blank flanges tightly caulked, submitting the valve to a pressure of 200 lb. per sq. in., equivalent to an effective head of 460 ft. As indicated by the position



of the spindle, the disc was at its highest point, the packing was removed and the stuffing-box gland lifted, as shown in the illustration. There was absolutely no sign of leakage at this point, giving conclusive evidence of careful and accurate machining of joints and of the efficiency of the several novel features in its construction. This is a signal victory in the construction of high-pressure water-gates, which will at once appeal to all who have in any way attempted the same test with the old fashioned type. The ease with which these gates can be re-packed under high pressure illustrates the progress made in the manufacture of hydraulic mining machinery, for which the Hendy Iron Works have always been noted.

Commercial Paragraphs.

THE MOORE FILTER CO., of New York, report having just closed a contract with the New Southern Cross Mining Co. at Cable, Montana, for a slime filter-plant.

H. L. ROPER & CO., of El Paso, Texas, are agents for the J. Geo. Leyner Engineering Co. for Arizona, the south half of New Mexico, and parts of Mexico. This company also represents the Crocker-Wheeler Co. and the Elspass Engineering Company.

P. P. CUPLIN of West Bend, Iowa, has issued a pamphlet describing his Pneumatic Prospector, a small machine weighing 10 pounds. This machine has been on the market for a number of years, and the sales have been gratifying to the inventor and manufacturer.

THE ALLIS-CHALMERS COMPANY has opened an office at Deadwood, S. D., with O. F. Purnell as district manager. Special attention will be given by Mr. Purnell and the members of his staff to the sale of mining, crushing, pumping, power, and electrical machinery.

FISHBACK, SCHMIDT & CO., mining engineers and metallurgists, of El Paso, Texas, are fitting and equipping a laboratory and ore-testing plant in that city, wherewith they will be well prepared to make assays, do umpire work, and make tests of ore to determine methods of treatment.

CHISHOLM, MATTHEW & CO., of Colorado Springs, Colo., have recently closed a contract with the Golden Cycle mill for four duplex Edwards furnaces, which are being installed as rapidly as possible. These furnaces take the place of other makes. The four already in the plant when the fire occurred are being repaired, as they were but little dam-

aged by the fire. This makes eight of the Edwards furnaces in this mill.

THE JOSHUA HENDY IRON WORKS, of San Francisco, report the sale of timber-framing machines to Red Metal Mining Co. of Butte, and the United Verde Copper mine at Jerome, and they have another framer nearly ready for shipment to the Anaconda Copper Co. at Butte.

F. W. BRAUN of Los Angeles and San Francisco has been awarded the gold medal at the Jamestown Exposition for the best display of assayers' supplies and chemicals. This firm is now permanently established at 576-584 Mission St., San Francisco, in a new reenforced concrete building.

THE KELLY FILTER PRESS CO. announces that its second 50-ton unit, recently installed at Pearl, Idaho, in the cyanide mill of the Black Pearl Mining Co., is now in successful operation. The purchasers are more than satisfied with the results being obtained from it. After more than a year's incessant labor incidental to perfecting the mechanical detail of an invention such as this, it is particularly gratifying to know that the two first commercial units have, in addition to fulfilling the expectations of the inventor, proved so eminently satisfactory to their respective purchasers; and the company derives no inconsiderable encouragement for redoubled effort from the fact that the Kelly filter today has for its heartiest supporters the Vindicator Consolidated and the Black Pearl mining companies.

Catalogues Received.

THE CYCLONE DRILL CO. of Orrville, Ohio, has issued a catalogue describing their churn-drilling and core-drilling outfits.

THE J. GEO. LEYNER ENGINEERING WORKS CO. of Denver has issued a catalogue describing the Leyner drill-sharpener.

THE B. F. STURTEVANT COMPANY of Hyde Park, Mass., has issued Bulletins 144 and 147, describing their bi-polar, four-pole, and eight-pole electric motors.

TELGEMANN & TORKA, INC., Pacific Coast agents for the Goerz American Optical Co., have issued a catalogue describing their engineering instruments.

THE JEFFREY MANUFACTURING CO. of Columbus, Ohio, has just sent us Catalogue D, illustrating their coal and ashes handling machinery for power plants.

THE A. LIETZ CO., of San Francisco, have issued 'Publication C,' a well illustrated catalogue describing the engineering instruments manufactured by them.

THE UNION IRON WORKS CO., of San Francisco, has issued a catalogue entitled 'The Union Improved Ore Feeders,' in which their improved Challenge and Tullock feeders are described.

THE C. O. BARTLETT & SNOW CO., of Cleveland, Ohio, have issued Catalogue No. 18 describing their line of elevating, conveying, mining, and milling machinery. It also contains some tables useful to engineers.

THE HENDRIE & BOLTHOFF MFG. & SUPPLY CO., of Denver, issues an interesting pamphlet on 'The Hoist Question.' This company manufactures both steam and electric hoists. On page 54 of the booklet it is stated: "We usually carry in stock all sizes of electric hoist frames up to and including No. 6, and with the large stock of induction motors shown on the next page we can usually make delivery upon any complete hoist within three or four days of date of order. This applies to hoists equipped with 440 volt, 60 cycle, 3 phase induction motors only. More time is required for direct current motors. Unless otherwise ordered, hoists will be equipped with steel pinions. Frames No. 1, 2, and 4 are regularly furnished with band brakes, and No. 5, 6, 7, and 8 with post-brakes, but any special equipment can be supplied upon request." The booklet is handsomely illustrated.

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TABLE OF CONTENTS

Editorial:	Page.
Notes.....	629
Humors of the Stringency.....	630
The Mining Congress.....	631
By the Way.....	632
General Mining News.....	634
Special Correspondence.....	638
Cripple Creek, Colorado.....	Wallace, Idaho
Salt Lake, Utah.....	Chihuahua, Mexico
Butte, Montana.....	Toronto, Canada
Concentrates.....	644
Discussion:	
Green Gold.....	T. K. Rose 645
Cost of Filtering.....	E. Burt 645
Cyanide Practice at Copala.....	Dana G. Putnam 645
Tube-Mill Lining.....	H. W. Hardinge 645
Professional Customs.....	Geo. A. Packard
.....	James W. Abbott 646
The Mine-Foreman.....	T. Skewes-Saunders 648
Articles:	
Diente, Mexico.....	E. McCormick 648
Smelter Smoke, With a Discussion of Methods for Lessening Its Injurious Effects.....	L. S. Austin 649
The Possibilities and Limitations of Geological Survey Work as Applied to the Mining Industry.....	George Otis Smith 652
History of Cyanidation.....	Philip Argall 655
Sliming Ore for Cyanidation.....	Mark R. Lamb 658
Mining in Quebec.....	658
Jeffrey Mining Machines.....	660
Mining and Metallurgical Patents.....	659
Departments:	
Personal.....	633
Market Reports.....	633
Commercial Paragraphs.....	660
Catalogues Received.....	660
Books Received.....	660

Editorial.

THE OFFICE of Mr. F. S. Wayne, our representative at New York, has been moved from 42 Broadway to 500 Fifth Avenue, at the corner of Forty-Second Street, which is a neighborhood easily accessible to mining engineers and near the building of the engineering societies.

SUBSCRIBERS in Mexico write occasionally to complain of the failure to receive the MINING AND SCIENTIFIC PRESS by reason of the fact that the paper is taken from the mail by those to whom it does not belong. Perhaps some of these pilferers will see this and feel a little shame for such a dishonest action. It may be that they think the means justifies the end and that larceny in the cause of technical knowledge becomes borrowing, but we trust that the authorities in charge of the mails will take a more correct view of such petty depredations and see to it that the sneak thieves are punished.

IN THESE gloomy days the spirits of anxious people may be lifted by telling of a kindly act that "shines like a good deed in a naughty world." We are in receipt of a letter from an alumnus of Lehigh, stating that he has learned that the library of that university does not get the MINING AND SCIENTIFIC PRESS regularly; therefore, he desires to pay for five years' subscription in memory of his father, an honored mining engineer, who died recently at Colorado Springs. The son, returning from Peru, says that he "looks forward to continuing the friendships which his father held so highly." Surely this is the sort of feeling that uplifts humanity, and makes men so much more than swift pursuers of the elusive shekel. The spirit of that subscription in behalf of Lehigh is worth more than a Carnegie library.

WE TAKE particular pleasure in giving our readers the address of the Director of the United States Geological Survey. This address was delivered by Mr. George Otis Smith, at Joplin, before the American Mining Congress, and dignified the occasion by presenting important considerations in an authoritative manner. We note a quotation from a reference, made by the present writer when in another place, in regard to the value of the work done by the Survey in the past, and the reading of the address will confirm the general belief that the usefulness of the Geological Survey will be enlarged and strengthened under the direction of its new administrator.

THE ARTICLE on smelter smoke by our friend Mr. L. S. Austin, professor of metallurgy in the Michigan College of Mines, is most timely, in view of further decisions of the Utah courts. Every bit of information on the problem is valuable, for it is of great importance

to the mining industry that smelting operations should not be crippled unduly, while at the same time it is fit and proper that the smelters should cause no wanton injury. We hope to see public opinion sufficiently enlightened not to be misled by pseudo-scientific experts hired by black-mailers. It is to the interest of the whole country that the smelting of ores should proceed and we hope to see it prosper without doing unnecessary harm to anyone.

IN MAY last E. H. Harriman went out of his way to state that in one month 800 broken rails had been discovered on the Union Pacific railroad and there ensued a controversy between the officials of the Steel Corporation and those of the railroad in regard to defective rails. Harriman retorted by giving an order for 150,000 tons of rails to the Tennessee Coal & Iron Company. At that time the control of the Georgia Central railroad, which connects with all of the plants of the Tennessee Coal & Iron Company, was purchased by Oakleigh Thorne, the president of the Trust Company of America. When, recently, the loans of the trust company were being investigated, it was discovered that Thorne was acting for Harriman. Comment is superfluous.

THE AMERICAN Newspaper Publishers Association has made an appeal for the abolition of the tariff on press paper. It is well. An effective way of decreasing the price of such paper would be to curtail the consumption of it, namely, by using less of it for the dreary mess that appears in bulky Sunday issues and by spoiling less of it in the form of a kind of newspaper that neither instructs, nor entertains, but simply debauches the public taste. The high cost of paper may be a 'tax on intelligence' but the plea that the daily newspapers instruct is a tax on credulity.

THE HIDEOUS TRAGEDY of Frank McLaughlin's death will recall the Feather river mining enterprise with which his name was associated. English capital to the extent of \$2,500,000 was spent in an elaborate scheme to dam and divert the waters of the Feather river above Oroville, with the purpose of working the gravel on the river bottom. When the engineering feat was finally performed, it was found that the miners of '49 had worked the ground and McLaughlin's enterprise collapsed. The Big Bend tunnel was another fiasco of a similar kind; in that case a sharp bend in the river bottom was drained by driving a tunnel through the peninsula formed by the winding stream. When completed, at a great expense, it was ascertained that all the best sand bars had been exploited by the pioneers, who built numerous wing-dams, sufficient to enable them to skim the cream of the alluvial deposit. The Big Bend tunnel is now the basis of a water-power enterprise, for a fall of 220 feet is available, enough to generate electric energy at a profit. Major McLaughlin, as he was called, belonged to the type of adventurer, promoter, and politician, with small scruples and a big heart, with queer notions of business and grand ideas of development, fearless and reckless, generous and irre-

sponsible. Such men have done much to develop the West during the frontier stage of civilization, when their qualities look bigger than their faults.

Humors of the Stringency.

HUMOR does not always mean fun; in this case the reference is to a condition of mind and its manifestations in act or word. We have all heard of the cynic who said that Boston was not a geographical entity but merely a state of mind the like of which might exist in a special manner near Cambridge and the Charles river, but was attainable even in Oklahoma or Nebraska. So with this panicky condition that is with us just now, it is a state of mind, cold as the atmosphere that envelops the proverbial Boston schoolma'am, for it has frozen the turbid stream of speculation and brought the ground ice of distrust to the surface of the quiet waters of industry. As in the case of the death of Cock Robin, everyone asks: Who did it? One man says reckless bankers, such as Barney and Morse; some say the stock gamblers, such as Heinze and Gates; others trace it to a deficient currency system and even raise a deprecating glance at the White House. The causes are as complex as the effects. The bursting of a boiler is not to be explained without some knowledge of the theory of steam. We have no special information on the subject and view the collapse of the credit system of a civilized community from the point of view of the average citizen, that is, the man in the street. Whatever the concrete causes at the back of present conditions and whoever the persons that touched off the explosion that reverberated amid the canyons of lower Broadway, it does seem fairly apparent even to the one-eyed that a public lately over-credulous and extravagant has suddenly become timid and miserly. Those that spent are hoarding; those that splashed about in spendthrift fashion are getting out of the water—the water that they failed to turn into golden wine by financial legerdemain. Queer results have ensued. Bonds dropped to a depressing level because it became profitable to sell bonds drawing 4 per cent in order to place the money on call at 10 or 12 per cent. Trust companies gave the names of depositors to the money-brokers so that those who made hasty withdrawals of cash at the time of the Knickerbocker suspension might be invited to release currency. For the latter a premium of 2½ to 3 per cent was offered. This premium drew hoarded money into service. The money-changers did a fine business, giving 2 to 3% premium on currency and paying therefor in certified checks of banks that are members of the New York Clearing House. The currency thus obtained was sold at a premium of 4, and even 5, per cent, that is, at a profit of about 2 per cent, to the banks, which required currency for out-of-town customers, or to employers of labor, who needed it for payroll purposes. Furthermore, the safe deposit companies also gave the names of their customers to the money-brokers, who went to the renters of safes and bid for the currency that had been withdrawn from circulation. Thus it was at New York. Meanwhile nearer

home we had an equally interesting exhibition of the workings of our financial system.

In San Francisco, the legal holidays declared by the Governor of the State have relieved the banks from the demands upon their currency, except for the urgent needs of customers; at the same time, in order to facilitate business and to circumvent those desiring to hoard specie, it has been arranged to issue Clearing House certificates of deposit, the issuance of which entails payment of interest at the rate of 8 per cent for the amount of certificates taken out by each bank. This has lubricated the wheels of industry, which otherwise might have been temporarily stopped. In order to obviate the payment of taxes delinquent at the end of November, such payments being due in currency or its immediate equivalent, the State Legislature has been called in special session and a bill is to be passed postponing tax payments for 60 days. Another effect of the legal holidays has been the closing of the courts, for Justice, like schoolboys, does not work on a legal holiday. By enactment of the Legislature the transaction of judicial business on legal holidays will be legalized and the machinery of the law set in motion.

The Mining Congress.

ANOTHER ANNUAL CONVENTION of the American Mining Congress has been held and we are reminded of the question put to Talleyrand, who, at the close of a protracted diplomatic conference, was asked: What transpired? "Three hours," he said. The meeting was like its predecessors in that it afforded an opportunity to foregather at a convenient centre, in this case, Joplin, in the heart of the lead-zinc mining region of Missouri. The Geological Survey was well represented, the technical press played a prominent part, some earnest men got a hearing, several aëro-thermal orators made things lively, there was much local hospitality, all of which was wound up by the customary exciting debate as to the next place of meeting. But it was no parliament of mining men or any such representative gathering as it ought to be.

The old directorate was re-elected and for a good reason, namely, the coterie in control know that new directors would lose their interest in the work and would be likely to let the Congress die of sheer inanition. The board of directors is not representative; scarcely three of them would be chosen by any large gathering of well-informed mine operators, and at least two of them are a source of weakness to any public organization, but until other and better men are willing to devote their time and energy to the Congress, it is illogical to expect the old guard to resign. There was the usual debate on smelter rates, with the usual inaccurate statements of irresponsible speakers, tending only to befog the real issues between those that sell ore and those that buy it. The mine-operator has nothing to gain from such a wrangle; he can secure just treatment from the smelters only by making careful statements of fact, calculated to win public opinion to his side. The tirades of local politicians will not accomplish this. Another example of

misdirected energy is afforded by the bureau of information, intended to help investors by telling them, in return for a small fee, whether any given mining enterprise is sound or not. Such a bureau can only be conducted by persons themselves not connected with mining schemes and by a staff especially qualified by knowledge of local mining affairs throughout the West—obviously, a large order, far beyond the bounds of the Congress as now constituted. On the other hand, a laudable example of self-restraint was shown in the refusal to recommend a plan for licensing mining engineers, with the notion that such regulation would prevent fraudulent practices. The Congress is in no position to discipline the profession, such a recommendation might come from the American Institute of Mining Engineers; but it never will, for the idea is impracticable. The choice of Columbus as the next place of meeting indicates the wish to make the Congress national in effect, as in name. This ought to win the support of the coal and iron mine-operators in the Middle West, but it may tend further to diminish the attendance of the metal-mining men who have given some support to the Congress during recent years—that is, since Mr. J. H. Richards has devoted himself so disinterestedly to his work as president. Next to the choice of a place of meeting, the most important question is that of a department of mines. Sentiment now favors a bureau, mainly because it is known that the authorities at Washington might be prevailed upon to favor a bureau, while likely to oppose the creation of a new department. Naturally, the President is an important factor and it is known that he favors the consolidation of existing departments rather than the making of new ones, the result of which is to make his cabinet too much like a town meeting. It is understood that Mr. Roosevelt has promised to recommend a bureau with a Commissioner of Mines at the head of it. Senators Heybourn, Hemenway, and Dalzell are willing to help such a plan, provided it is sufficiently comprehensive in scope. The Director of the Survey is not standing in the way, although naturally, Mr. Smith regards the Survey as competent to do most of the things a bureau is expected to accomplish. The idea then would be to enlarge the Survey and convert it into a Bureau of Mines; but we hope, in the best interests of the Survey, that its geological character will not be further diluted and that, on the contrary, any new bureau will take from the Survey its technological and statistical work, leaving its officers free for the particular scientific labors for which they are specially qualified. Messrs. Smith, Holmes, Lindgren, Parker, Siebenthal, and Hess were in attendance at the Congress and added greatly to the usefulness of it; they carefully refrained from introducing any resolutions or influencing action through committees. In this respect they exhibited notable tact. On the whole, the most useful feature of the Congress was the opportunity afforded to explain to the public the character of the work and purposes of the Geological Survey, and the strengthening, therefore, of sentiment in support of scientific investigations that are of the greatest value to the mining industry.

By the Way.

In a recent issue of the *Electric World*, Mr. John E. Brady has this to say concerning the utility of inventions:

Utility, as predicated of inventions, means industrial value; the capability of being so applied in practical affairs as to prove advantageous in the ordinary pursuits of life, or to add to the enjoyment of mankind. But a mere curiosity, a scientific process exciting wonder, yet not producing physical results, or any frivolous or trifling article of operation not aiding in the progress nor increasing the possessions of the human race, whatever be its novelty, and whatever skill has been evolved in its production does not fall within the class of useful inventions nor become the subject matter of a patent. It has been said that the test whether an invention is useful in the sense of the patent law is not whether it is not mischievous or hurtful, or insignificant, but whether it is capable of use for a purpose from which some advantage can be derived. If it be useful in this sense, the degree or extent of its usefulness is altogether immaterial. It is not necessary that it should be the best means of producing a desirable result, but a means, although inferior to others, of producing it.

Inventions which accomplish definite practical results may nevertheless possess such attributes as to destroy the benefits that otherwise they would bestow upon the public. Inventions whose chief or only value resides in the facilities which they afford to men to perpetrate some wrongful injury either by fraud or violence upon each other, are thus regarded as destitute of real utility. For the same reason arts or instruments which, if completed and in actual use, might be of benefit to their employers, are sometimes held to be devoid of real utility on account of the great risks incurred in their construction. The courts, in their consideration of this subject, must necessarily contemplate the entire scope and effect of the invention, as well upon the maker and operator as upon the consumer.

The acts of Congress which authorize the grant of patents for designs, were plainly intended to give encouragement to the decorative arts. They contemplate not so much utility as appearance. The law manifestly recognizes that giving certain new and original appearances to a manufactured article may enlarge the demand for it, may enhance its salable value, and may be a meritorious service to the public. It, therefore, proposes to secure for a limited time to the producer of those appearances the advantages flowing from them. Utility is not negatived by the fact that the manufacture covered by the patent has no function except to decorate the object to which it is designed to be attached. In such cases utility resides in beauty. Whatever is beautiful is useful, because beauty gives pleasure, and pleasure is a kind of happiness, and happiness is the ultimate object of the use of all things.

It seems that utility is negatived if the function performed by the invention is injurious to the morals, the health, or the good order of society. Thus, an invention to improve the art of forgery, or one to facilitate the spread of a contagious disease, or one to render water or air intoxicating would, of course, be unpatentable for want of utility. The more completely such an invention could perform its function the more objectionable it would be in this respect. In the case of *National Automatic Device Co. v. Lloyd*, the complainant moved for an injunction restraining the infringement of a patent for a toy automatic race-course. The device covered by a patent consisted of a shaft projecting upward from the centre of the base of a circular shell or case, to which shaft a clock-work mechanism was so geared that it could be made to revolve

rapidly by releasing the escapement of the clock-work. On the shaft were mounted two or more radial arms, to the ends of which were attached small top figures of horses. The clock-work was released by dropping a coin through a slot in the machine, whereupon the shaft would revolve, carrying the radial arms with it, for a short time, when the clock-work would be shut off allowing the arms to revolve of their own momentum. The proof showed that the only use to which the device had been put was to install it in saloons and other drinking places, where the frequenters thereof might lay bets as to which toy horse would be the last to stop or would stop nearest a certain designated point; in other words, the machine was used only for gambling purposes. For this reason the machine was held not to be a benefit to society or 'useful' within the contemplation of the patent act and the patent was declared void.

Inventions, the object of which is to afford amusement and diversion, are classed among patentable subjects; but only the mechanical agencies employed can be patented. Under this rule it was held that the patent of the Paul Boynton Co., covering an inclined gravity railroad terminating in a body of water which provided an amusement popularly known as 'shooting the chutes,' was invalid, one of the reasons being that, in view of the old art of launching ships, there was no patentable novelty in the combination of an inclined railway located near a body of water and a boat-shaped car or toboggan, adapted to move downward over the railway and to be propelled forwardly upon the water by the momentum derived from its descent.

In the *Cushman* case, an electrical patent was refused on the ground of the absence of utility and an appeal was taken from the decision of the Commissioner in so refusing. The device for which a patent was sought consisted of an improved method for protecting objects from the effects of lightning by surrounding that part of the lightning rod which is embedded in the earth with a galvanic battery. The reason which the Commissioner gave for refusing a patent was that the intensity of the action arising from either the copper or the zinc plate, or both, in the earth, is thousands of times too small to be sensible as compared with that of a flash of lightning. "The latter has force enough to strike through hundreds or thousands of feet, or sometimes through miles of air. The former has not force enough to strike through the thousandth part of an inch. These are well known facts and the thing must be entirely without practical effect." The court was satisfied that the device in question could be put to no beneficial use and the Commissioner's refusal was affirmed.

The degree of utility is not material and a patent may rightfully issue, so far as that quality is concerned, provided the invention be of some use and benefit. Nor does the simplicity of a device indicate in any way the absence of utility, for this is a recommendation of the usefulness of the article rather than an objection thereto. The existence of utility in an invention is not to be determined by comparing it with other arts and devices, but is rather to be ascertained by an examination of the particular art or device in question. It is not essential to the patentability of a device that it should supersede or be superior to others previously used for the same purpose; nor does the fact that an invention has been displaced by some subsequent invention import a lack of utility. If, however, a patented article rapidly takes the place of all others of similar kind and is successful commercially, these are considerations tending to show that the public welfare has been advanced by its production and that it is characterized by utility within the meaning of the patent laws.

Personal.

A. C. BEATTY is at El Oro.
 PERCY L. FEARN is in Costa Rica.
 JOHN A. REID, of Stockton, is on a visit to this city.
 FOSTER HEWETT has returned to Pittsburg from Peru.
 H. DEC. RICHARDS is here, on his return from New York.
 H. A. SHIPMAN has returned to Denver from New York.
 CARL HOFFMANN is at Boston; from there he will go to Mexico.
 H. W. TURNER is investigating dredging operations at Oroville.
 E. MCCORMICK, of Calumet, Mich., is now at Metcalf, Arizona.

FRED. G. FARISH has returned to Denver from the Dutch East Indies.

C. J. BANDMANN has returned to San Francisco from Ketchikan, Alaska.

S. I. HALLETT, of Colorado, is spending some time at Chihuahua, Mexico.

W. H. LANAGAN and FRED L. MORRIS have returned to San Francisco from Alaska.

MARK R. LAMR, of Mexico City, was recently in Parral, Torem, and Durango, Mexico.

LOUIS HOFER has been placed in charge of the El Palmarito mine in Sinaloa, Mexico.

D. C. BARD, of the Globe Mines Exploration Co., has returned from Cœur d'Alene to Butte.

J. C. BAWDEN has been appointed superintendent of the Standard Consolidated mine at Bodie.

W. E. DEFTY, of Phoenix, is now engaged on examination work in Yavapai county, Arizona.

D. A. MACDONALD, on his return from a season's work in Alaska, is now at Berkeley, California.

E. A. WALL, of Salt Lake, leaves soon for the East, where he and his family will spend the winter.

W. H. LEFFINGWELL is chief engineer for the Mono Power Co., of Bishop, Inyo county, California.

ALBERT I. GOODELL has resigned as manager of the Northport smelter, and has returned to Colorado.

LEON BLV has accepted the position of consulting engineer with the Pacific Power Co. at Red Bluff, California.

J. H. MACKENZIE has been appointed general manager for the Goldfield Consolidated Mines Co.; he is now at Goldfield.

S. A. WORCESTER has completed designs for a new surface plant for the Henry Adney mine at Cripple Creek, and is now at Victor.

F. MORTON CLARK, who is engaged in mining near Culiacan, in Sinaloa, is in San Francisco, on his return from a visit to New York.

J. W. FINCH, lately manager for the Goldfield Consolidated Mines Co., has been appointed consulting geologist to the same company.

F. C. MOREHOUSE is general manager of the Palmilla mine at Parral and of the Mexican Con. M. & S. Co., at Guanaxaco, Durango.

THOMAS KIDDIE, formerly in charge of the Britannia smelter at Crofton, B. C., has been appointed manager of the Northport smelter.

WALTER R. CROSBY, general manager of the Chas. Butters plant at Virginia City, is convalescing from a severe illness at Berkeley, California.

A. L. DICKERMAN, of Colorado Springs, consulting engineer for the J. A. Coram mines in Mexico, was at Parral, Chihuahua, last week inspecting the Palmilla mine.

WALLACE, GLORE & SUMMERHAYES is the name of a new firm of mining engineers and metallurgists, the members of which are H. Vincent Wallace, H. Gordon Glore, and Maurice W. Summerhayes. Their offices are at Nogales, Arizona.

Latest Market Reports.

LOCAL METAL PRICES—Nov. 21.

Antimony.....	13@17c	Quicksilver (flask).....	\$45.50
Casting Copper.....	18@19c	Spelter.....	7@ 7.75c
Pig Lead.....	4.50@ 5.45c	Tin.....	39½@41c

ANGLO-AMERICAN SHARES.

Cabled from London.

	Nov. 13.	Nov. 20.
	£. s. d.	£. s. d.
Camp Bird.....	0 17 0	0 16 0
El Oro.....	1 1 3	1 2 0
Esperanza.....	1 11 3	1 11 0
Dolores.....	1 0 0	1 0 0
Oroville Dredging.....	0 14 4½	0 14 4½
Stratton's Independence.....	0 2 9	0 2 9
Tomboy.....	1 7 6	1 7 6

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.

Date	Electrolytic Copper	Lead	Spelter	Silver
Nov. 15.....	13¼	4.43	4.98	58¼
" 16.....	13¼	4.38	4.95	58½
" 17.....	Sunday. No market.			
" 18.....	13	4.38	4.93	58½
" 19.....	12¾	4.33	4.90	59½
" 20.....	12¾	4.33	4.90	59½
" 21.....	12¾	4.33	4.90	58½

COPPER SHARES—BOSTON.

Closing prices.	Nov. 21.	Closing prices.	Nov. 21.
Adventure.....	87½	Michigan.....	44
Ahmek.....	45	Mohawk.....	44
Alton.....	23¼	Nevada Con.....	6¾
Amalgamated.....	46½	North Butte.....	35½
Areadian.....	3	Old Dominion.....	21¼
Atlantic.....	8	Osceola.....	77
Balakiala.....	3	Parrot.....	9
Bingham Con.....	47¼	Phoenix.....	1
Boston Con.....	8¾	Quincy.....	73
Butte Coalition.....	13¼	Raven.....	75
Calumet & Arizona.....	94	Rhode Island.....	2¼
Calumet & Hecla.....	550	Santa Fe.....	13¼
Centennial.....	20	Shannon.....	93½
Con. Mercur.....	26	Superior & Pittsburg.....	84
Copper Range.....	50¼	Tamarack.....	57
Daly-West.....	10½	Trinity.....	10
Franklin.....	6¼	United Copper com.....	7½
Granby.....	75	Utah Copper.....	13½
Greene-Canaan, etc.....	5¼	Victoria.....	1
Isle Royale.....	14¾	Winona.....	31
Mass.....	2½	Wolverine.....	109

MINING STOCK QUOTATIONS—NEW YORK.

	Closing Prices.	Nov. 13.	Nov. 20.
Bingham Central.....	10	9½	10
Boston Copper.....	5½	5	5
Cumberland Ely.....	5	5	5
Dolores.....	2¼	1¼	2¼
El Rayo.....	3	3	3
Guanajuato Con.....	5¼	5¾	5¾
Giloux Con.....	7¼	6¾	7¼
Greene-Canaan.....	57½	54	57½
Nevada Con.....	25	23	25
Nipissing.....	1	1	1
Tennessee Copper.....	1	1	1
Tonopah Ex.....	1	1	1
Tonopah-Belmont.....	8½	7½	8½
Tonopah.....	8	7½	8
United Copper.....	16	14	16
Utah Copper.....			

(By courtesy of Hayden, Stone & Co., 25 Broad St., New York.)

SOUTHERN NEVADA STOCKS.

San Francisco, Nov. 21.

Atlanta.....	8 22	Laguna.....	75
Belmont.....	90	Manhattan Con.....	25
Columbia Mtn.....	15	Midway.....	45
Combination Fraction.....	87	Mizpah Extension.....	10
Daisy.....	78	Mohawk.....	8.00
Fairview Eagle.....	63	Montana Tonopah.....	1.25
Florence.....	2.60	Nevada Hills.....	3.25
Gold Bar (Bullfrog).....	33	Red Top.....	2.00
Goldfield Con.....	3.95	Sandstorm.....	21
Goldfield of Nevada.....		Silver Pick.....	24
Gold Kewanas.....	23	St. Ives.....	37
Great Bend.....	27	Tonopah Extension.....	95
Jim Butler.....	45	Tonopah of Nevada.....	7.50
Jumbo.....	2.00	Tramp Con.....	19
Jumbo Extension.....	60	West End.....	33

(By courtesy of W. C. Ralston, 368 Bush St.)

General Mining News.

ALASKA.

The Guggenheims have had 1,500 men working in the Klondike this summer. The Hammon Syndicate, composed of W. P. Hammon and associates, has purchased several claims on Hunker creek and Gold Run creek this summer.—In the Atlin district the Guggenheim steam-shovel and electric haulage plant on Pine creek operated all the season, handling about 2,000 cu. yd. gravel per day. The Pine Creek Power Co. and the North Hydraulic company were still piping in October. The latter company has a steam ditching dredge at work enlarging their supply ditch, but the work cannot be completed this summer. This company has a large reservoir in Surprise lake, about 16 miles long and one mile wide. A dam has been built across the mouth of this lake; the dam holds back enough water to furnish a constant supply of 12,000 in. per day during the season. On the McKee creek the Amalgamated McKee Creek Hydraulic Co. piped throughout the season. The shortage of water on Birch creek hampers work on that creek, but Pearce & Co. made a good clean-up there this season. On Ruby creek drift mining was done by the local syndicate, which obtained control of the individual claims. Weight creek, a south tributary of Pine creek, where considerable gold was mined in the early days of the district, has again produced considerable gold this season. The Otter Creek Development Co. is working the upper part of Otter creek with some success. Some development is being done at the Beavis quartz mine on the north shore of Atlin lake and about a mile from town.—The Guggenheim interests have awarded to M. J. Heney, who built the White Pass & Yukon railway, the contract for the construction of the Copper River & Northwestern railway from Cordova to Copper river. The choice of Cordova as the western terminus, although lengthening the road, avoids the building of a breakwater, as would have been necessary if Catalla had been chosen. E. C. Hawkins will be chief engineer.—At Ketchikan the Cuprite Copper Co., whose property adjoins the Jumbo group on the northeast, is doing considerable development work. The adit, which will cut the vein at a point 180 ft. from the portal and at a depth of 100 ft., is 100 ft. long. The vein occurs at the contact between granite and limestone; the ore is chalcopryrite.—Owing to early snows, all work has stopped at the mines on Porcupine creek.

ARIZONA.

COCHISE COUNTY.

A rich strike of ore was made last week on the 800-ft. level of the Lucky Cuss mine, which belongs to the Tombstone Consolidated Co. The ore is a carbonate carrying much horn silver and some gold; the ore comes from a point fully 200 ft. below the water-level. This new orebody is thought to be the extension of orebody, which made the Lucky Cuss famous years ago and which was lost on the 510-ft. level.—It is stated that the Copper Queen Co. has disposed of the surplus copper which has accumulated during the last four months.—The Copper Queen and the Calumet & Arizona companies at Bisbee have decided to work seven days in the week so that, with the reduced wages, the men can earn as much as formerly. Both these companies are working as many men as before the drop in the price of copper, as they are doing much development. Considerable trouble is being experienced at the Spray and Gardiner shafts of the Copper Queen Co. and the Irish Mag of the Calumet & Arizona with gas, which is thought to come from a worked-out stope on the boundary of the two properties where the timbers have caught fire. Bulkheads are being built to confine the gas to the abandoned area. The bulkheads at the Gardiner have been finished and the gas has been shut off from that mine. Bulkheads have been built on the 950 and the 1,050-levels of the Irish Mag and the gas has been shut off from that mine, but as yet it has not been possible to control the gas at the Spray shaft;

the building of these bulkheads has caused the gas to take a new course in the Spray and now it flows downward into the 600 and 700-ft. levels of that mine. The gas is so strong that miners can only work 10 to 15 minutes when they have to be relieved, in some cases reliefs have been necessary every 5 minutes.—Instead of completely closing their mines, the Shattuck-Arizona and the Denn-Arizona companies have decided to continue development work with a small force.

GILA COUNTY.

Owing to the financial stringency the Old Dominion company is only paying 200 men per day; this began Nov. 15 and it will take several days to pay all the employees. The Old Dominion is again working six days per week and it is expected that the company will soon follow the policy of the Bisbee companies and again work the full week.—The Gem shaft of the Globe Consolidated is now 1,170 ft. deep and a station is being cut at that level; the shaft is to be sunk 30 ft. deeper so as to provide a good sump. At the Mallory shaft a cross-cut is being driven on the 860-ft. level.—Almost half the ore smelted by the Old Dominion



Map of Arizona.

Co. is custom ore, for instance in September less than 2,000,000 lb. of the 3,500,000 lb. of copper produced came from the company's mines. The lower levels at the Old Dominion mine have drained the upper levels to such an extent that the 8th and 9th levels are now quite dry. The ore on the 9th level, discovered over a year ago but not worked to any great extent on account of the water, is quite rich and is self-fluxing. From the winze on the 16th level a cross-cut is being driven to develop the sulphide orebody found on the 14th level.

PINAL COUNTY.

The Hercules & Arizona M. Co., whose property is near Ray, has resumed work with a small force of men.—Both the Oklahoma Copper Co. and the Altai company, have all the machinery installed at their properties near Florence and they will soon be producing.—Some rich copper ore has been discovered at the property of the Sultana & Arizona Co. near Kelvin.—In the Mammoth district, the Calumet & Arizona Co. continues to develop the group of claims, which it has bonded.

CALIFORNIA.

BUTTE COUNTY.

The deep channel has been struck at the Snow mine, in the Kimsheew district. This property is near the Sky High mine, several miles east of Stirling. Development on a

large scale will begin soon. It is stated that the gravel carries \$4 per car. O. C. Barber and F. M. Clough of the Diamond Match Co. are interested in this mine.

INYO COUNTY.

(Special Correspondence).—The present money stringency does not seem to have any great effect on the development of the prospects and mines in this vicinity. Reports of new discoveries are coming in from the White Mtn., about 10 miles east of this place, and some very good bodies of lead ores, principally carbonate, are being opened up.—Crane and Forbes are pushing development work at their prospect as rapidly as possible. They have a body of high-grade carbonate ore; as yet they have not reached the hanging wall.—A. A. Casler, general manager for the Buckeye M. & S. Co., which is operating a property at Poverty Hill, about eight miles south of this place, reports that ground is now being broken for the new two-compartment shaft, which is to be sunk to a depth of 500 ft. This company has a large body of medium-grade gold and silver ore; it is the intention of the company to thoroughly block out this ore before erecting a reduction plant. Mr. Casler states that the company intends to keep a large force of men at work until the two-compartment shaft is completed.—C. E. Cady, who is associated with Colorado Springs people, has a force of men at work on his copper prospect, which adjoins the McAfee mine. This property is opened by an adit over 400 ft. long, which has developed a body of copper ore from 5 to 25 ft. wide, carrying from 3 to 7% copper, and from 4 to 16 oz. silver. It is the intention of the management upon the completion of the present work to patent the property. This is considered one of the best copper properties in this section.

Big Pine, Nov. 15.

The adit at the Killian mine is now 300 ft. long. Everything is in good shape for the winter and the company expects to double the force at this mine soon.—Some rich silver-lead ore has been found on the claims belonging to Bishop and Ellis in Marble Canyon; these are situated between the Black Canyon and Silver Cliff properties.

NEVADA COUNTY.

The shaft at the Niagara mine, on Deer creek, is now 300 ft. deep. On the 300-ft. level a cross-cut has been started. A blower has been installed. The shaft is being sunk deeper.—An open-cut about 100 ft. long has been made at the Belle Union mine and a cross-cut adit, which is to be driven a distance of 200 ft., has been started. This mine produced considerable gold, when worked years ago, but this work stopped at water-level. As there was good ore in the shaft when work was suspended, the company expects to find ore when they reach the vein.—Robert Johnson has found some good ore in some veins on his ranch, six miles south of Grass Valley. The vein in the shaft, which is 21 ft. deep, is $3\frac{1}{2}$ ft. wide. A pump is to be installed and then the shaft will be sunk deeper.—The first two sets of timbers are now in place at the new two-compartment shaft being sunk at the Midas mine, at Randolph Flat. Two shifts have been put to work, as the shaft-house and blacksmith shop are almost finished. This shaft will cut the vein at a depth of about 70 ft. Some good ore has been found on the Davis property adjoining the Midas and on which the Midas company has a bond.

PLUMAS COUNTY.

Standard and McGill have struck a rich vein of ore in one of the cross-cuts on the Eureka group near Greenville. This ore is said to assay \$30 to \$40 per ton and is all free-milling. This mine is near the Indian Valley property on the same ridge.—During the past month the Indian Valley M. Co. has purchased and taken options on several groups of claims near their original patented locations. It has bought the Treleven homestead, which lies just north of the mine, as they required it for dump ground and as a millsite for the cyanide plant, which the company intends to build.

Three steam scrapers have been ordered by the Newton M. & D. Co. for their placer mine in Long valley, near Quincy. The gold occurs in a dry hillside gravel; one scraper is in operation at present, its capacity being from

500 to 1,500 cu. yd. per day, according to the bedrock and the gravel. The cost of handling the gravel is stated to be from 3 to 5c. per cu. yd. S. T. Norris is superintendent.

SIERRA COUNTY.

The main tunnel at the South Fork property, near Forest, is at present almost 4,900 ft. long and very close to the Maple Grove line; as soon as that point is reached, a raise will be driven to the channel, which, owing to the character of the ground, is thought to be quite near. This company owns a long distance along this channel which, when worked in the Bald Mountain property farther north, yielded several hundred thousand dollars.—The boarding-house at the West Point mine, near Monte Cristo, was burned last week.

YUBA COUNTY.

Arrangements have been made so that the contract for the construction of the north restraining wall on the Yuba river near the Bayard Kupser farm has been given up by Mr. Munson. W. P. Hammon and associates have agreed to do the work provided they are allowed to have the gold, extracted from the gravel dredged to make this wall. This embankment will be made much larger than was originally planned by the Government engineer.—The shaft at the Bessie mine, in Brown's gulch, is 20 ft. deep and at that level drifts are to be started both to the north and south to develop the vein, which is from 18 to 36 in. wide. The mine is equipped with a steam-hoist and good pump, so that no trouble with water is expected. This property is north of the Dannebrog, Jefferson, and Pennsylvania mines. J. C. Campbell of Nevada City owns the Bessie.—Charles D. Lane is sinking a shaft to develop the Dannebrog, Jefferson, and Pennsylvania mines at depth. These mines produced a large amount of ore in the past from workings near the surface.

TRINITY COUNTY.

A body of rich ore has been struck at the Bonanza King mine, near Carrville, in the northern part of this county. A full force of men is working at this gold mine. J. F. Littlefield is superintendent.

TUOLUMNE COUNTY.

The Sheep Ranch mine has been closed at least for the winter. For some time past work has been done at this mine in a desultory manner, but it was hoped that the company would straighten out its affairs.—The Imperial mill is about ready to start.—A steam hoist is being installed at the Joy property near the Imperial. As soon as the hoist is installed a force of miners will be put to work.—Negotiations are being made for the sale of the Republican mine.—The annual assessment work is being done at the Rough and Ready mine on Table Mtn. near Montezuma. There is an adit at this gravel mine over 1,000 ft. long but this as yet has not cut the deep channel. Considerable gold was taken from surface workings on this property in early days.—The cam shaft at the Goss mill at Tutletown broke last week and the mill was shut down several days but it is running again.

COLORADO.

CHAFFEE COUNTY.

(Special Correspondence).—W. H. Jenkins is erecting a 200-ton mill for the Mary Murphy Co., to be used in treating custom ores from the surrounding properties as well as ore from the Mary Murphy mine. The plant will be concentrating and cyaniding. It is estimated that this company has 150,000 tons ore in the Mary Murphy and 70,000 in the Black Hawk, which it has leased. They also estimate they have 50,000 tons on the dump at the Mary Murphy. An effort is being made to get the mill under cover before winter sets in.

St. Elmo, Nov. 16.

CLEAR CREEK COUNTY.

(Special Correspondence).—Last week the East Argentine company shipped 100 tons of ore to the Santiago mill in Georgetown, where a concentration of 11 to 1 was made. The concentrate assayed 250 oz. silver, 0.24 oz. gold, 30.5% lead, and 15% zinc per ton, while the middling assayed 78.96 oz. silver, 0.22 oz. gold, 7.8% lead, and 25% zinc per ton. This ore comes from the blind lode intersected 2,125

ft. from the entrance of the adit; this orebody is from 2 to 3 ft. wide. Some first-class ore occurs in a streak varying in width from 12 to 18 inches.

The Sidney adit is now 2,800 ft. long. Work at this property will continue throughout the winter and M. Sidney, who is manager, states that regular shipments will be maintained.—Work was resumed last week at the property of the Leavenworth M. & M. Co., situated on Payne's peak. The lower cross-cut, now 100 ft. long, is to be driven to cut the B. B. lode No. 1, which looks well in the upper workings. It is expected that the vein will be reached within 75 ft. R. H. Blackman is superintendent.—Shipments are being made from the Cram vein, which is being worked through the Doric adit; the vein was cut 2,400 ft. from the portal of this adit. Stopping is in progress upon a body of smelting ore; the vein is 3 to 4 ft. wide in this stope, which is 115 ft. long. The ore being shipped assays \$137 per ton in gold, silver, lead, and copper. The ore sent to the mill assays \$19 per ton, and is concentrated 5 into 1.—A strike was made this week in the Centennial mine, situated in Georgetown. In catching up a cave in the main adit, a streak of smelting ore was found which is 4 to 6 in. wide. Some assays gave 2 to 2½ oz. gold and 25 oz. silver per ton. The discovery was made 400 ft. from the entrance of the adit near the orebody which was mined about seven years ago; it is believed that this is a continuation of that ore-shoot. Stopping is to begin in a few days. H. Ratholz & Co. are operating this block of ground under lease.—In the Centennial adit, which is being driven on company account, a body of heavily mineralized quartz has just been cut at a distance of 500 ft. from the portal. Several stringers of high-grade ore occur in this quartz, and David Kennedy, the manager, thinks that a rich body of smelting ore is near by. Considerable work is being prosecuted on the 500-ft. level from the shaft workings, and a body of ore assaying in places two ounces gold is being followed which varies in width from 18 in. to 3 ft. A fair output is being made at the present time.—At the Mineral Chief mine, while driving the Brown or sixth level, an orebody of medium grade, 4 to 6 ft. wide, is being followed. The ore is left standing until the new 50-ton concentrator, being built just below the Georgetown depot of the Colorado & Southern, is finished. No amalgamation is to be used in this mill, as the ore found in the Mineral Chief workings is inclined to be somewhat zincy. F. A. Maxwell is superintendent of the mine, while Frank Graham is in charge of the concentrator.—At the Muscovite property, the old workings have been cleaned out and retimbered, and the adit is being extended so as to gain greater depth. E. E. Grubb of Georgetown is superintendent of the Muscovite.—The Terrible property, situated on Brown Mtn., has been leased to Wm. Wood, who has agreed to keep the compressor plant in steady operation. A number of sub-leases have already been granted and several of these lessees are shipping ore. The concentrating ore is to be treated at the company's mill. The Terrible-Dunderberg property has produced several million dollars of ore, and most of it assayed over \$100 per ton in silver and lead.—The aerial tramway being constructed by the Santiago M. & M. Co. is nearing completion. This tram is to be one mile in length, the terminus of which will be at the Wilcox tunnel on the line of the Argentine Central Ry. Ore-bins have been erected, and by means of chutes the ore can be dumped into cars for shipment to the company mill and sampler in Georgetown. The Santiago is now being operated under the leasing system. Wm. Rogers of Georgetown is general manager for the company. Georgetown, Nov. 18.

MICHIGAN.

ONTONAGON COUNTY.

The Adventure Consolidated Copper Co. has levied an assessment of \$1 per share, payable November 16 to 27; \$20 has already been paid in on this stock. Explorations with the diamond-drill are still being made on the Baltic formation at this property. Mining operations are confined to No. 3 shaft.—The Lake Copper Co. has found some rich copper ground in its shaft on the Baltic formation. One mass of copper weighed half a ton, while a number of

smaller chunks have been taken out.—The old Union shaft is being unwatered by the Calumet & Hecla Co. Thomas Wilcox is superintendent of this work and also the diamond-drill prospecting that this company is doing on other properties in the Porcupine district, which it holds under option.—The 6 by 8 ft. shaft on the property, belonging to R. P. Mulock, which lies just west of the Copper Crown, is 25 ft. deep. This vein known as the Creek vein, to develop which this shaft is being sunk, looks quite promising at the surface.—Development, made by W. H. Garlick on his property near Union bay, has uncovered a good vein of copper ore 8 ft. wide. This vein is in sandstone and is several hundred feet west of the formations formerly prospected in this property.

NEW MEXICO.

GRANT COUNTY.

(Special Correspondence).—The Forrest Queen copper mine, situated eight miles north of Silver City, is being developed under the management of M. D. Gaylord, of El Paso. Within a distance of 700 ft., ten veins were intersected in the cross-cut; samples from these veins averaged 22% zinc, 3% copper, 10 oz. silver, and \$2 gold per ton. A considerable amount of driving has been done on some of the veins, one of which is reported to be 40 ft. wide. A shaft is also being sunk. About 300 tons of ore, coming from near the surface, have been shipped; this ore averaged 11% copper, and 8 oz. silver.

Silver City, Nov. 11.

SOCORRO COUNTY.

M. D. Gaylord, of El Paso, is developing a lead mine in the northern end of the San Andreas Mtn., 28 miles east of Socorro. In the adit a vein carrying 12% lead ore has been cut. There is said to be 5,000 tons of lead ore on the dump; this came from work done by former companies while prospecting this vein.

NEVADA.

CHURCHILL COUNTY.

At present many prospects at Wonder are not working full-handed, and some are closed down owing to the present financial and smelter difficulties, still all the four shipping mines—the Nevada Wonder, Jack Pot, Hidden Treasure, and Vulture—are still working.—The shaft of the Hidden Treasure mine is now 165 ft. deep, and is in good ore.—A rich strike of ore is reported to have been made last week on the 500-ft. level of the Nevada Wonder.—The Quartzite is sinking a new shaft; this will be sunk to a depth of 200 ft. before any driving is done. The area at Wonder, through which ore is scattered, is 4 miles wide by 6 miles long. The camp is at present about 14 months old; it is 61 miles from the railroad.

ESMERALDA COUNTY.

The output of the Goldfield district for the week ending Nov. 15 was 4,939 tons, having an estimated value of \$456,450. When one considers that the Little Florence has stopped shipping and that the Mohawk Jumbo is closed, when one also bears in mind that the smelters are refusing all ore below \$60 per ton and are increasing the smelting rates, this output indeed is remarkable. The output of the Little Florence and the Mohawk Jumbo alone averaged almost 3,000 tons per week at the time that they quit shipping. Many of the mines are making only small shipments and are waiting for a clearing up of the financial troubles. The shipments from the different properties during the week were as follows: Mohawk, 1,350 tons; Mohawk Combination, 2,193; Begole lease, 326; Rogers Goldfield Syndicate, 111; Florence Annex, 62; St. Ives Leasing Co., 68; Diamondfield Black Butte, 41; Red Top mine, 53. The Combination treated 595 tons of ore from the Combination mine, averaging \$50 per ton; the Kinkead mill treated 140 tons of Red Top ore, averaging \$45 per ton.—The output of the Goldfield Consolidated for the last six months was 46,644 tons of shipping ore; for the last three months, 29,491; for October, 13,548 tons.—As the Mohawk Combination and the Begole leases only have two weeks more to run, every effort is being made to hoist to surface as much ore as possible. Whatever ore is at surface by the expira-

tion of the lease is credited to it, whether shipped or placed temporarily on the dump. Some very rich ore has been struck on the 275-ft. level of the Begole lease this last week. Most of the Begole tonnage is hoisted through the incline shaft belonging to the Mohawk Combination.—The Little Florence lease has been connected with the 400-ft. level of the Rogers Syndicate lease and surveys are now being made to determine the boundary between these two leases.—The Little Florence is still piling rich ore on the dump at the rate of 100 tons per day. A cross-cut is being driven on the 500-ft. level. Much of the ore mined comes from the 400-ft. level. The company is trying to make arrangements with the Selby smelter to treat its ore.—The orebody recently struck in the Florence Annex is looking as promising as ever. The orebody where it is being developed on the 300-ft. level is 2 ft. wide and is said to average \$400 per ton. The first two carloads shipped from this lease averaged nearly \$600 per ton. The cross-cut on the 400-ft. level has cut the orebody and it is expected that on the 500-ft. level the vein will be reached sometime this week.

(Special Correspondence).—Owing to the scarcity of money, the Consolidated company and the Mohawk Combination lease, operating on the same property, have posted notices stating that the miners would be paid one-half in cash and the other half in exchange drafts. The miners are not inclined to accept these conditions, but realize that until delayed settlements can be made with the smelters, a shut-down might otherwise result. A special meeting of the Miners' Union was called by Charles McKinnon, the president, and after a lengthy discussion a committee was appointed to confer with the mine operators to devise a remedy for the present money stringency. The miners want the smelters to send all Nevada bullion direct to the mint and to demand coin therefor; that the smelters then pay for ore in cash, and that the mine owners pay their men in cash, as soon as this arrangement can be satisfactorily put into operation.—Several leasing companies have suspended operations, being unable to continue without funds, which are temporarily tied up in the Nye & Ormsby County Bank and the State Bank & Trust Co.—It is of common occurrence in Goldfield at the present time for mining engineers and promoters to shoulder a pick and shovel.—John W. Finch has resigned as manager of the Consolidated, and becomes advisory engineer, while John H. Mackenzie has been appointed general manager. Mr. Mackenzie comes from San Francisco, where he is in partnership with F. W. Bradley. He was formerly superintendent of the Independence at Cripple Creek, and then manager of the Le Roi at Rossland, British Columbia.

Goldfield, Nov. 18.

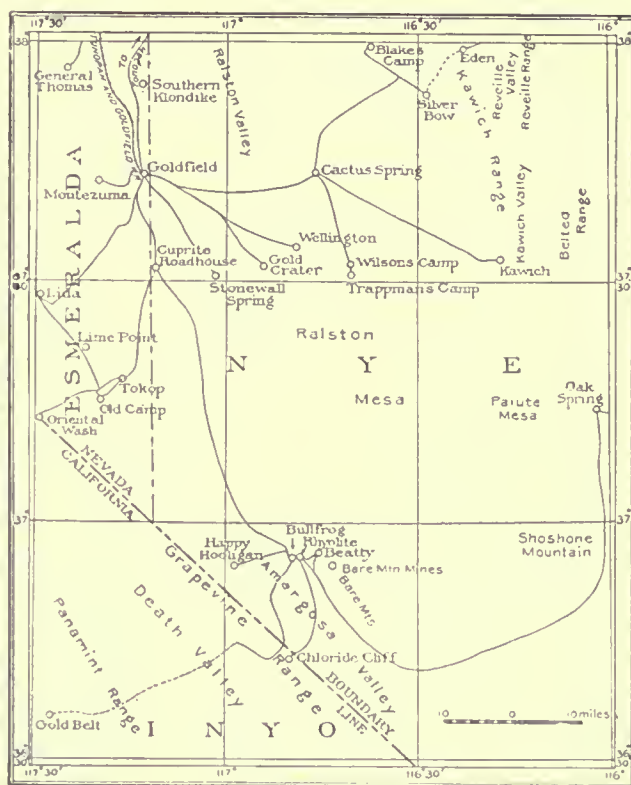
EUREKA COUNTY.

The Osceola mine at Palisade has increased its force to 25 men. A winze is being sunk on the ore-shoot recently found in the cross-cut. This mine ships each month two cars of high-grade silver ore carrying some lead and about 3% copper.—The Palisade-Pittsburg Co. is still driving the cross-cut adit; this will cut the vein at a depth of 300 ft. Twelve men are working at this property. At surface the vein-capping is over 40 ft. wide.—A vein of good copper-silver ore has been cut by the adit on the Hankins group of claims.—Walter Morrissey and partners have discovered an 8-ft. vein of lead-silver ore on their group of claims adjoining the Palisade-Pittsburg property.

NYE COUNTY.

(Special Correspondence).—Affairs are looking rather blue at Rhyolite, for, owing to the tightness of the money market, practically all the prospects in the Bullfrog district have been forced to shut down. At present 100 men are employed in the mine and mill of the Montgomery-Shoshone Co., but there are only 75 to 100 men employed at all the other properties in the district. The Tramps Consolidated, the Montgomery Shoshone, the Bankers National, the Homestake-King, the Amethyst, and the Phillips & Moesser lease on the Gibraltar are working. The Mayflower has shut down, but it still intends to build the mill; underground work has been stopped at the Goldbar until the mill is built.—The Tramps adit is still being driven ahead. The

Denver shaft is now 500 ft. deep and still in ore. The Denver vein has been faulted three times in this distance, but it has been recovered each time after a little prospecting. Some ore is being shipped from this shaft, as much of the ore is high-grade. At the Eclipse adit two good shoots of milling ore have been developed, while in the Hobo there is also some good milling ore. A full force of men is working at the Tramps properties.—At the Montgomery Shoshone work is progressing quite satisfactorily. The mill is doing good work and much ore is being shipped; at present about \$1,000 of amalgam is being cleaned up from the plates each day. It is expected that the company will ship about 4,000 tons of ore to the Salt Lake smelters this month. This tale ore assays about \$100 per ton. The Polar shaft is 300 ft. deep and has been connected at that level with the main Shoshone shaft, through which the hoisting is done. This is a 3-compartment vertical shaft at present 570 ft. deep; sinking is still going on in this shaft. Levels are run at



Part of Nevada.

every 100-ft. mark. Water was first struck 45 ft. below the fifth level; at present 30,000 gal. per day are pumped from this shaft. Over 12,000 ft. of development work has been done on the Montgomery Shoshone property. Much good ore which came from this development work is on the dump. In the Polar there is considerable milling ore and some shipping ore, but most of the shipping ore comes from the tale orebody in the Shoshone. Twelve air-drills are used at this mine. The compressor and the mill are run by electric power from the Nevada-California Co. power-line coming from Bishop, Cal. The Shoshone mill has a capacity of 250 tons; the ore is crushed in Blake crushers, rolls, and Huntington mills; then it is amalgamated and concentrated on Willey tables and Frue vanners; the tailings are then cyanided, the sand being treated in agitators, the slimes in Butters filter-tanks.—Work is progressing slowly on the Homestake mill.—The Homestake-King mill will be running soon.—The 10-stamp mill at the Gold Bullfrog, north of Rhyolite and in the vicinity of the Mayflower, is working about half-time owing to scarcity of water.—At the Pioneer, prospecting is still going on in the attempt to find the vein which has been faulted.

Rhyolite, Nov. 16.

BRITISH COLUMBIA.

The shipments from the mining districts of this province last week were as follows: Boundary, 32,233 tons; Rossland, 5,775; East of Columbia, 4,130; total, 42,138 tons.

Special Correspondence.

Toronto.

Late News.—Serious Condition of Ore Market.

In view of the uncertainty of the market for silver and the general financial situation the American smelters are refusing to accept shipments of Cobalt ore. All that is now going forward is being sent under old contracts. As a result, many of the mine-owners are adopting a policy of retrenchment and will reduce their working forces. The directors of the Tretheway have decided only to work a day shift, which will leave only 25 or 30 men employed. A. W. Johnson, vice-president of the Canadian Copper Co., was in town this week in conference with leading mine-owners over the situation, which is regarded as serious.

Cripple Creek, Colorado.

Anchoria-Leland and Ethel Louise Leases.—Increase in Output of District.—Effect of Low Treatment Rates.—Strike in the Red Bird.—The Dante.—A Pumping Agreement.

The Anchoria-Leland and Ethel Louise companies have adopted the leasing system under the single management of William I. Howbert. The western portion of the Anchoria-Leland property, with the shaft-house, has been leased to George E. and F. G. Whip and H. D. Benton, for a period of 18 months. The City View claim of the Ethel Louise has also been leased for a period of 18 months, with a flat royalty.—The Eagle Ore Co. has found it necessary to employ a night force at its sampler for the first time in several months, obviously as a result of the recent reduction in treatment charges. About 600 tons per 24 hr. are sampled. It is reported that the allied railroad lines are hauling more ore at the present time than for many months. The Union plant at Florence has resumed operations and this fact renders a large number of narrow-gauge cars available, relieving the car shortage and the congestion in the Standard plant at Colorado City. There is a well authenticated rumor that still another cut in rates will be announced at the close of this month; 50c. on \$8 ore being the rate in contemplation. The output for November is expected to be exceptionally heavy.

The Ophir is installing a boiler at a new shaft being put down from the surface.—The Cresson mine has increased its output by the installation of an electric tram and Crane washer; the production for November is expected to reach 2,500 tons.—A strike is reported on the Red Bird claim of the National on the outskirts of the city, on the west slope of Gold hill.—The El Paso Co. is planning to resume operations on lessee account in December, although no shipments will be permitted to leave the property before January, the inference being that all ore must go to the Golden Cycle mill on the resumption of operations at that time, and with which the El Paso management has a long-time contract. Lessees, however, can commence work on the 10th of next month, when the hoist at the main shaft will be available. Plats of the underground workings have been completed by T. R. Countryman. The management is already besieged with applications for leases, and all available territory is greatly in demand.

The Dante property is coming rapidly to the front as one of the best producers of the district; the British-American Co. on the South Dante has opened a large body of ore, the walls of which have not been determined, although stopes 20 ft. wide are worked, and the output has been better than a car a day for the past two months, with returns of \$25 to \$80 per ton. R. L. Jame-

son & Co., operating on the North Dante, believe they have cut the extension of the shoot opened by the British-American Co. and that another lease of like value on the same property is in their possession.—The Pharmacist Co. has shipped two cars of a high average, 5 oz. per ton being expected.—John Sharpe is reported to have another rich strike near the surface on the west slope of Battle Mtn., a small seam giving assays as high as \$300 per ton.

The Joe Dandy mill, after three months operation, is reported to be operating successfully on \$5 ore, of which there are large quantities in the mine; 75 tons per day have been handled, but the full capacity of 100 tons is expected to be reached within a month.—An addition to the Isabella cyanide mill is contemplated; two vats are to be constructed of a capacity of 125 tons.—The Ironclad mill management consigned a retort valued at \$2,400 to the mint at Denver, representing a 13 days' run on \$2 ore.—An exceptionally high average has been maintained on ore shipped by Humphreys & Thompson from the Little Clara lease; they obtained \$80 per ton on all ore shipped, or a total production for October of slightly over \$42,000.

A. R. McLeod & Co., the first to obtain a concession under the new leasing system on the Midget property, make an initial shipment of 18 tons to the Portland mill.—The Strong and Portland companies are reported to have entered upon a pumping agreement in order to unwater the lower levels of the respective properties; the combined pumping plants can handle 1,600 to 2,000 gal. per minute.

Salt Lake, Utah.

Smelters Cease Operation.—Effect of Judicial Decision.—Prospects of Resumption.—Utah Consolidated.—Shipments from Tintic.—The Daly West Resumes Work.

The announcement of the closing of the lead and copper smelters of the United States Smelting, Refining & Mining Co., at Bingham Junction as a result of the decision of the Court of Appeals in affirming the decree of the Federal Court of the district of Utah, while it will work a temporary hardship on several mining companies, which had contracts with the smelting company, will do no permanent injury. Outside of the smelting company's own mines in Bingham and possibly two or three mines in the Tintic district there will be no curtailment or enforced shut-downs. As far as the Tintic mines are concerned, the situation will soon be relieved through the completion of the new lead smelter of the Tintic Smelting Co. which will be ready about the middle of January, if not before. This plant can easily take care of the output of the Uncle Sam, Colorado, Lower Mammoth, and Grand Central mines, which have been either obliged to curtail on account of a request from the smelting companies or shut down entirely as a consequence of the closing of the Bingham Consolidated and United States smelters. It is believed, however, that at least the lead smelter of the United States company will be allowed to resume operations to a limited degree. The company has gone to great expense within the past year in the erection of a bag-house for the arrest of the deleterious substances contained in the fumes. In view of the fact that the American Smelting & Refining Co. will be permitted to smelt ores as heretofore at its Murray plant by some amicable understanding with the farmers who appeared as plaintiffs in the smoke cases under a stipulation asking the Court for a modified decree, it would seem that it would be unjust to the United States company to force the latter to retire permanently from the Utah field. The American company has done no more

than the United States company toward retaining the flue-dust, which does the damage to vegetation. It has simply been more fortunate in bringing the farmers around to their senses, and it has required a little ready cash to do it.

The Utah Consolidated copper smelter, near Murray, which was also subject to attack, and which has probably done more damage than all the other plants combined, owing to the heavy sulphide character of the ores treated there, is still in operation, and there appears to be no disposition to close shop until the mandate of the Court is actually given. In the meantime the company's attorneys are arranging to perfect an appeal to the United States Supreme Court, provided the lower court does not feel disposed to modify its order of injunction permitting the company to go on with its smelting of ore until such time that its proposed new smelter can be erected in Toole county. It will take at least a year to build this plant, the site has been selected and practically all the preliminaries arranged preparatory to the letting of contracts. The plans were drawn several months ago by engineers employed by the Amalgamated Copper Co., and are said

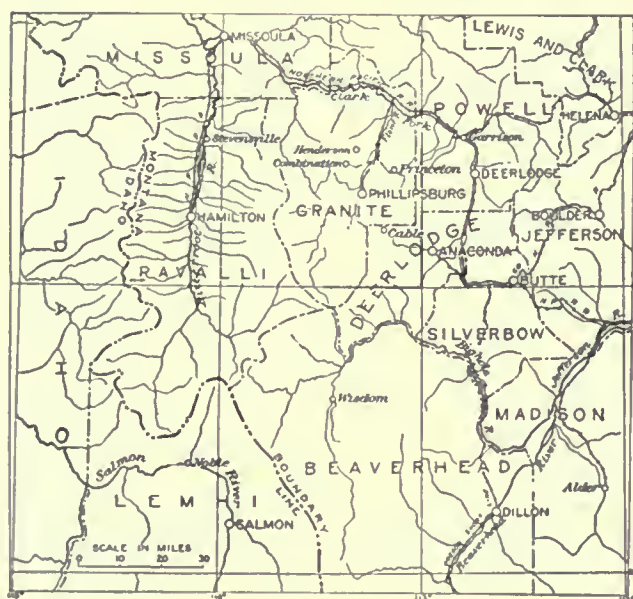
sumed actual mining. At the Ontario, however, a force is engaged in the work of restoring the drainage adit.

Butte, Montana.

Smelter Smoke Cases.—Effect of Utah Decision.—Local Opinions.—Barnes-King Affair.—Fresh Reports on the Mine.—Conditions at Butte.

The full text of the opinion of the United States Court of Appeals in the Utah smelter case has not been seen in Butte, but the attorneys for the 'smoke farmers' of the Deer Lodge valley claim the decision is binding on the Federal Court in Montana in the injunction suit against the Washoe and Anaconda companies, in which it is sought to close the big Washoe smelter at Anaconda. The Master in Chancery in the Washoe case found that some damage was being done to the farms by the smelter and that the injury was continuous, but he advised against an injunction on the ground that the defendant companies were able to respond in any amount of damages and that the closing of the plant would be an irreparable injury to the State of Montana and disastrous to several communities, especially Butte and Anaconda. The Master also found that the closing of the smelter would be a great injury to the 'smoke farmers' themselves, as it would take from them practically the only market they now have for their produce. When these findings were announced they were generally regarded as favorable to the companies, though they were not entirely satisfactory to either side, and both have made requests for modifications. In view of the decision of the Court of Appeals in the Utah cases, the attorneys for the farmers say the recommendations of the Master in Chancery cannot be considered by the District Court, but that the latter must, as a matter of course, grant the injunction against the Washoe smelter and can not take into consideration the injury that would be done to the communities or even to the State. However, that is only one opinion; whatever the facts of the decision in the Utah case, the Washoe case is in many respects different. The Master has found from the evidence that the land has not been damaged by the sulphur fume emitted by the smelter, and the damage by sulphur has been the great cause of complaint in Utah. The damage done in Montana has been from the arsenic thrown out by the big smelter stack. It is a fact, however, that the damage by the arsenic was done before the tall stack was built and before the Washoe began saving the arsenic, and now very little of that substance escapes. It is possible still further to curtail that cause of damage and practically save all of it. If that is the case the main source of trouble may be removed entirely. At any rate the closing of the Washoe smelter is still a very remote possibility. As found by the Master in Chancery, the present site of the smelter is probably the most available in the entire State and less damage is done by it than would result if placed anywhere else. The Washoe is the largest smelter in the world, and the most economical of operation. It was erected at a cost of about \$10,000,000. An injunction against the smelter would necessarily result in closing the mines of the Anaconda, Butte & Boston, Parrot, Washoe, Trenton, North Butte, and Coalition companies, all of which have their ore treated at the Washoe.

Reno Sales, geologist for the Amalgamated Co., and E. E. Chase, a mining engineer of Denver, have completed their examinations of the Barnes-King mines. Mr. Chase made his examination for Boston stockholders, and it is not known here what his report has been, but it is understood that his findings in effect confirm the reports made by Messrs. John Gillie and Charles



Montana.

now to be in possession of the executive department of the Utah Consolidated at New York.—Because of the inability to finance its metal product the Utah Smelting Co., which has been operating an independent copper smelter near Ogden during the present year, has ordered the fires drawn. The plant has been treating about 250 tons per day.

Ore shipments from the Tintic mining district last week amounted to 101 carloads, the contributing mines and amounts being: Beck Tunnel, 2; Colorado, 5; May Day, 5; Yankee Con., 4; Uncle Sam Con., 3; Eureka Hill, 3; Centennial Eureka, 45; Bullion Beck, 1; Lower Mammoth, 9; Mammoth, 6; Ajax, 2; Carisa, 1; Scranton, 7; Godiva, 1; Tintic Iron, 7 carloads.—The ore and bullion settlements reported last week by Salt Lake banks amounted to \$461,000.—The Daly-West Mining Co. has resumed operations at Park City after a shut-down of about seven weeks, brought on by the strike of miners, who took offense at the management for discharging a union shift-boss, followed by a refusal to reinstate him to his old position. The men have gone back to work under a new schedule of wages agreed to by the operators of the camp and which amounts to a reduction of from 25 to 50 cents per day. The Daly and Ontario companies, under the same management, have not re-

W. Goodale as to the low grade of the ore and the limited quantity of ore available. Mr. Sales made only a geological examination, and that was not encouraging for the stockholders. His observation as to the ore in reserve also confirms the findings of Gillie and Goodale. The present directors of the Barnes-King have declined to bring suit against the former directors and the promoting syndicate to recover some of the money alleged to have been fraudulently obtained and disbursed, and some of the stockholders are now moving to bring such action themselves. The Barnes-King mill had been shut down for some time, owing to the fact that the supply of cyanide ran short, but operations have been resumed. The old shaft on the property is being sunk deeper for the purpose of getting under an orebody recently cut by a diamond-drill. The ore, as disclosed by the drill-cores, is very low-grade, and unless richer deposits are found it will not pay to exploit. The mine at present is not paying expenses and the treasury is gradually being exhausted by the development work.

Stories have been published about alleged business depression and gloom in Butte on account of the curtailment of copper production and the consequent reduction of the number of men employed in the mines. There is anything but gloom apparent in Butte, and no sign of business depression is yet in evidence. Notwithstanding the fact that the Butte mines are at present producing but little more than a fourth of the normal amount of copper, the reduction of the working force has not been in the same proportion and the monthly payroll amounts to more than \$600,000 yet. With the exception of the suspended State Savings Bank all the banks of Butte are paying cash to everybody that calls for it, and they are shipping cash to every one of their country bank correspondents who asks for it, which few other cities of the country have been doing. Local conditions did not cause the suspension of the State Savings Bank. There are no idle men in Butte, for all those that were laid off at the mines have left the district or have found employment on the immense amount of railroad construction work now in progress in Montana, much of it near Butte. Men of families and householders have been retained in employment at the mines and they keep Butte as good as any three or four other cities of its size. To see the great crowds of people on the streets, in the stores and theatres, one would not think that half the working forces at the mines had been laid off.

The Pittsburgh & Montana Copper Co. has resumed operations and is running its smelter to the full furnace capacity, treating its ore by the same process used when the smelter was in operation before. It will be remembered that its plant was closed down during the spring of 1906, because the production of the mine was then only about 100 tons of ore per day. Since then, and up to the present time, the company's ore has been treated by the Washoe Copper Co. at Anaconda. This was a good arrangement for Pittsburgh & Montana as long as its production was small, but when the output reached 350 tons per day and the large body of ore on the west side of the property and the 15 ft. vein on the 800-ft. level were developed, the reason for shipping ore no longer existed. The recent published statements regarding the amount of money spent upon an experimental furnace, and the rebuilding of the plant, are without any foundation. The company's product is being treated by the same process as it was during the operation of the plant in 1905-1906, and it is using now, as it did then, the Bagley process, eliminating entirely water concentration and calcination in roasting furnaces. The report current that the company is rebuilding its smelter is incorrect and is probably due to the fact that it is planning to add

large furnaces, capable of melting 500 tons of ore per day, and another converter in order to provide for present production. The buildings were originally built so that additional furnaces and converters could be installed without disturbing or changing other portions of the plant. The Pittsburgh company has quite an advantage over a great many of the other copper producers, by reason of the fact that its ore carries from four to six ounces of silver per ton and a larger percentage of copper than any other mine in Butte, with one exception.

Wallace, Idaho.

News from Coeur d'Alene.—Effects of Financial Stringency.—Idaho Northern Railroad.—The Surprise and Monitor Mines.—Strike in the Virginia.—Transfer of the Idora.

The Coeur d'Alene district is still affected by the money stringency in the East and the low prices of the metals; both factors are reflected in reduced dividends and working forces in some of the larger mines. The list of closed mines gets longer daily, the last news of this kind being the dismissal of between 40 and 60 miners from the Hecla, a well-known and regular dividend-payer. To add to the general gloom, word has just been received that the directorate of the Idaho Northern railroad and the management of the Federal Mining & Smelting Co. have been unable to reach an agreement with regard to the right-of-way through a parcel of land owned by the latter at Kingston, and in consequence of this, construction work on the road is practically at a standstill and most of the hands have been laid off for the time being. The completion of this railroad will open up the entire north side of the district, where there are many mines with ore ready to ship, but all of these are now practically idle on account of the want of railroad accommodation. The railroad would also give a fresh impetus to the gold mining industry of the Murray district, but now, in addition to the Federal company, it is reported that many of the ranchers through whose ground the railroad passes, as well as the placer miners, will attempt to hold up the promoters of the railroad for as big a cash payment as possible, with the result that litigation is sure to follow and completion of the line is materially delayed. It was hoped that the railroad would be completed next year.

No more ore is to be shipped from the Monitor mine in the Saltese district until better market conditions prevail. This mine has been a steady copper shipper and has already declared one dividend. Supplies for winter have been laid in and the development of the mine will continue with a full force of men as before.—An assessment of 1½ cents per share has been levied on the capital stock of the Surprise mine, which recently closed down its concentrator in the Wardner district. The assessment was levied for the purpose of meeting an indebtedness of \$13,784. Since the beginning of the year the mine has been re-timbered and improved generally, including the erection of the concentrator, new bunk-house, and boarding-house, etc., at a cost of \$44,619, while the receipts from the sale of ore were \$30,835, leaving a deficit of \$13,784 still to be met. In the meantime the mine will be developed with a small force until the metal market improves, when both mine and mill will be worked to full capacity.—A 7-ft. vein of silver-lead ore has been struck in the Virginia mine near Carbon Center. The strike was made at a depth of about 180 ft. and about 300 ft. from the mouth of the adit. There is some good shipping ore on the dumps at present and much of the ore recently cut is of good concentrating quality.—The mill at the Rex mine has been practically completed and will probably be operated

before the end of the month. It is designed to handle about 250 tons daily. The lead will be sold to the American Smelting & Refining Co. and the zinc will be shipped to a smelter in Kansas. The mill will be operated principally by water-power, but two motors and electric connections have been installed in case of any insufficiency of supply or interference by frost. The cost of handling the ore will be \$1 per ton.

Herman J. Rossi and John H. Nordquist of Wallace have taken over the control of the Idora mine, against which a number of liens were filed by miners and a suit has been commenced for the recovery of the amounts due thereunder. Walter J. Nichols of Spokane has been given a first mortgage on the property and all of the debts have been massed. Notices are about to be circu-

shaft of the mine is full of water, the pumps having been drawn.—A 6-ft. vein carrying six inches of ore has been found in the Trade Dollar mine, at Burke, which is being worked by the Smuggler-Virginia owners under lease. The ore carries zinc and iron sulphides and some galena, and is in a formation similar to that of the Hercules mine.

Chihuahua, Mexico.

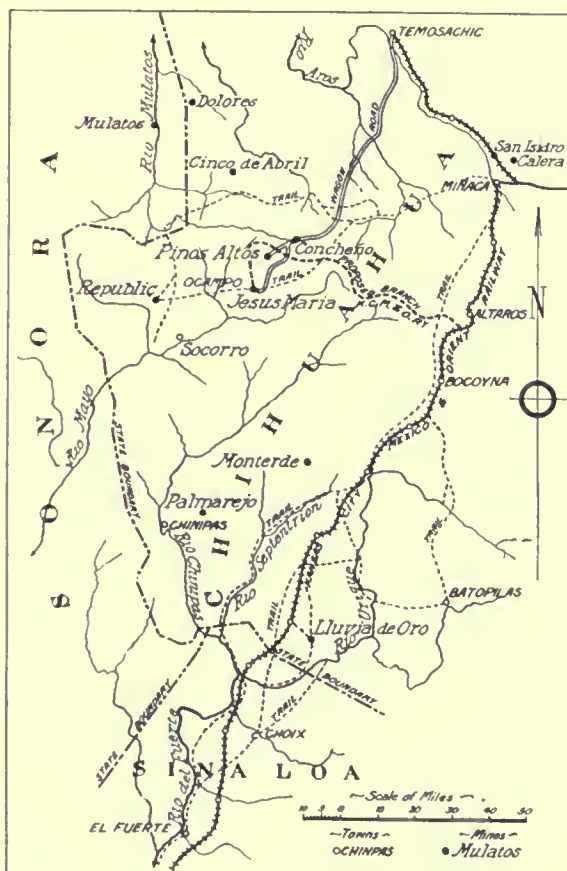
Chihuahua Mining Co.—Successful Work at Santa Eulalia.—A. S. & R. Mines.—A New Tramway.—Santa Eulalia Exploration Co.—San Toy Co.—A Power Station.—Pinos Altos Mine.

The Chihuahua Mining Co., of which Grant B. Schley of New York is president, is operating the Chihuahua and Potosi mines in the Santa Eulalia district. W. J. Quigley of Chihuahua is financial agent, B. L. Farrar being mine superintendent. The two mines are 1,500 ft.



Map of Idaho.

lated among the stockholders giving them an opportunity to take 400,000 shares of treasury stock at 4 cents, and it is calculated that the sale of less than 100,000 shares will cover the indebtedness. An option was given to F. Augustus Heinze on the property in July, but this has not been taken up, and as this stipulated that no treasury stock was to be sold during the time of its existence, the management was of course barred from disposing of any while there was yet a market. After the option had lapsed there was no market for the stock and this accounts for the temporary embarrassment of the company. Development work is to be resumed at once and pushed during the winter under the management of Rossi and Nordquist. The mine has already made several shipments of ore and the erection of a mill is contemplated. —A force of men have been set to work repairing the buildings, etc., at the Vienna International mine on Placer creek, which were recently destroyed by fire. The new buildings will be of corrugated iron, but it is expected that the work will consume at least 60 days. The



Map of Part of Mexico.

apart and their workings are connected. The Chihuahua shaft is 1,900 ft. deep, the several levels that run from the shaft into the orebodies being from the 1,000-ft. station down. At this point is a porphyry overflow, 600 ft. deep, which was passed through before the lime was encountered. The ores, which are a silver-lead carbonate and iron-lead sulphides, occur in shoots within a fissure in the lime. The ore-shoot in the Chihuahua is found to have a maximum width of 300 ft. The carbonate ores are mostly between the 1,000 and 1,500-ft. levels. Below the latter the lead is in the form of galena, accompanied by silver. The sulphide ores are said to be largely of milling grade and therefore a concentrating mill is in contemplation. The Potosi shaft is 1,700 ft. deep, over which is a steel head-frame and a double-cone drum steam-hoist and a Leyner air-compressor. A second shaft on the Potosi has also been sunk to a depth of 1,600 ft. In the Potosi are large bodies of silver-lead carbonates, and richer sulphides than occur in the Chihuahua. In the Potosi are bodies of

zinc carbonates which are distinctly separated from the lead carbonates. The sulphides, at greater depth, are composed of iron, lead, and zinc, accompanied by silver. In the matter of erecting a mill, consideration will be given to the zinc ores and it is possible that magnetic separators will be included in the equipment. The higher-grade zinc ores have been shipped regularly for the past two or three years. This company has its own railroad line, which runs from the Hacienda Robinson, near Chihuahua, to its mines above Santa Eulalia.

The American Smelting & Refining Co.'s operations in the Santa Eulalia district are centred at the Santo Domingo, Velardeña, Mina Vieja, and San Antonio mines, all under the management of W. J. Mitchell. The first three are practically contiguous in the central part of the district, the last named being separated from the others by a short distance. The Mina Vieja is referred to as one of the oldest and one of the richest mines in Mexico. It yields a highly silicious ore, carrying an average of 80 oz. silver per ton. This ore occurs in irregular deposits in the lime, the silver being in the form of a chloride. The Santo Domingo is a heavy producer of ore, carrying 14% lead and 14 oz. silver per ton; the San Antonio ores approximate 18 oz. silver per ton and 24% lead. The Velardeña is not as yet producing, though much has been accomplished in the way of development. The lead ores in these mines are carbonates, associated with iron, carrying from 30 to 40% of the latter. There is some galena, though as yet it is not of great importance. The Mina Vieja and Velardeña are at present being equipped with electric-hoisting machinery, the power for which is generated at the Santo Domingo mine. These mines have been producing from 5,000 to 6,000 tons per month, though temporarily this has been cut down to 4,000 tons. Shipments thus far have been made over the Mineral Railroad to Chihuahua, then transferred to the Mexican Central line, necessitating a change from narrow-gauge to standard-gauge cars; but the plans of the company contemplate the building of an aerial tramway to extend from the Velardeña shaft to the new A. S. & R. Co. smelting plant, situated on the main line of the Mexican Central, eight miles from the mines. It is anticipated that the furnaces of the new smelter will be blown in some time in December. The further plan is to utilize the Velardeña shaft as the main hoisting centre for the Velardeña, Mina Vieja, and Santo Domingo workings. Ore shipments to the new smelter will begin as soon as the plant is ready.

The Santa Eulalia Exploration Co. of California is operating the Buena Tierra mine in Santa Eulalia district. Wm. A. McGee is president of the company; Dr. H. Nelson Jackson is managing director, with Felix Chappellet as assistant manager. The company's holdings embrace 36 pertenencias, part of which were purchased from the Hearst estate. The mine is worked through a 1,460-ft. shaft, which was sunk in the lime, and seven levels from it have been driven into the ore deposit. The first level is 480 ft. below the collar of the shaft. The property is equipped with two Babcock & Wilcox tubular boilers, a 150-hp. hoist, 7-drill compressor, a 75-ft. steel head-frame. The shipping bins are on the railroad of the Chihuahua Mining Co. The ores consist of sand carbonates and galena, carrying about 12 oz. silver per ton, 16% lead, 33% iron, 9% lime, 2% manganese, 13 to 15% silica. Within the last four years shipments of ore have aggregated 125,000 tons. Up to a month ago shipments, which are made to the El Paso smelter, were running 150 tons per day, which now are reduced to half that amount. Like other mines at Santa Eulalia this one is free from water and requires no timbering.

The San Toy Mining Co. owns and operates the Galdeana and the Juarez mines, situated in the Santa Eulalia district. The former is an old property which has been in possession of the San Toy company six or eight years; the latter was purchased last year at a price said to be \$1,500,000 gold, by Chas. M. Schwab and associates, who control the San Toy company. A Trenton Iron Works aerial tramway line, $4\frac{1}{2}$ miles in length, having steel towers, conveys the ore from the Galdeana to the lower part of the foothills, where there are loading bins. From this point the ore is hauled to the Mexican Central railroad over the San Toy Company's standard-gauge railroad, $4\frac{1}{2}$ miles in length. The distance from the Galdeana to the Juarez is $1\frac{1}{4}$ miles, and the two mines are being connected by an aerial tramway of the Leschen type, so that, in a few months, the ore from the Juarez can be delivered to the railroad without the use of pack animals, as is now the case. The main tramway has a capacity of 750 tons per ten hours, while the new line, from Galdeana to the Juarez, will have a capacity of 500 tons. The company is building a central power station at the Galdeana mine, and the intention is to use electric power for the hoist, the compressors, and all other purposes. A steam-plant will be installed to operate steam turbines, by which the generators will be driven.

The Galdeana workings go to a depth of 1,200 ft. and those of the Juarez to 340 ft. While the workings of the two mines are connected, the plan is to operate a central hoisting plant on each group. The two mines are on the San Juan shoot, on which some other properties are located. It takes the direction of a crescent, as to strike, and is a fissure in the lime. The shoot is irregular in width, but it is 200 ft. wide and 100 ft. high in some places. The ores comprise a silver-lead carbonate. Those taken from the Juarez are said to carry 50 to 60 oz. silver and 5 to 15% lead. The ore in the Galdeana is a little lower, but of fair grade. Part of the ore is silicious, part of it high in iron. Shipments now are running at about the rate of 200 tons per day. Much of the mine-work is being directed to developing and blocking out the ore. J. P. Hutchinson, a stockholder in the company, is general manager, with L. A. Dockery, of Chihuahua, superintendent.

The Pinos Altos mine, of which T. N. Barnsdall of Pittsburg, Pa., is principal owner, is situated in the heart of the Sierra Madre mountains, 200 miles west of the city of Chihuahua, being 100 miles by stage from Temosachic, the terminus of the Chihuahua Pacific railroad. The mine is said to have produced ten million pesos in recent years. The holdings comprise a concession of 30,000 acres, with water rights. E. M. Ray, consulting engineer for Mr. Barnsdall, states that there are on the concession many gold-bearing fissures in basalt and porphyry and that there are extensive orebodies exposed ready for milling. The old mill is being rebuilt and modernized, equipment for concentrating and cyaniding having been decided upon. This will include filter-presses. Orders have been placed for water-wheels, electric generator, and motors, the intention being to install a power-plant within the next eight months. The site is on the Mayo river in western Chihuahua, a region that is said to be heavily timbered.

The Calera Mining Co., operating the Calera mine at San Isidro, 15 miles west of Chihuahua, recently completed and placed in operation its new mill, which handles a lead, iron, and zinc sulphide ore, with crushers, rolls, Sutton & Steele dry concentrating tables, and Wetherill magnetic separators. It is claimed the mill is doing satisfactory work. The property belongs to Moore & Schley and associates, Charles Pringle being the local manager.

Toronto, Canada.

Exposure of a Fraud.—Larder Lake District.—New Discoveries at Cobalt.—Ore Shipments.

The revelations made in the course of the trial of the charges brought against Law & Co., mining brokers, by the *Canadian Mining Journal*, will certainly result in the suppression of wild-cat flotations, for a time at least, whatever may be the immediate issue. The hearing was resumed on Nov. 6 and has since been continued, resulting in a thorough exposure of one of the most villainous swindles ever perpetrated under the pretence of mining. Briefly the facts brought out are these: The defendants, Frank Law, Lockhart Russell, and W. A. Abendroth, comparatively recent arrivals of unknown antecedents,

shares. Then Frank Law sold to Law & Co. \$1,000,000 of his shares for \$50,000 in notes; and Law & Co. put these shares on the market at 10c. each. No other stock has been offered, the defence advanced being that the defendants as directors of the Highland Mary, cannot be punished for what they did as members of the firm or Law & Co. Abendroth, who is secretary of both companies, admitted under examination that he knew nothing of the affairs of the Highland Mary, did not know what title, if any, they had to their claims when he was appointed secretary, or what salary he was to get. He was, he said, merely a figure-head, and signed the prospectus without knowing whether the glowing statements it contained were true or not. The prosecution called J. C. Murray, editor of the *Canadian Mining Journal*, to testify as to the condition and value of the 30 claims, but his evidence was ruled out on a technicality, as the charge was not one of fraud. As a matter of fact, on 15 of these claims there is no outcrop, and nothing of value has been found on the others. No development work whatever has been done, which is hardly surprising, as there has been no money to do it with, as all the receipts from the bargain-counter sales have been absorbed by Law & Co. Moreover neither Law & Co. nor the mining company have any title to the property, as patents are not given until 240 days development work has been done on each claim, and the certificate is liable to cancellation in case no valuable mineral is discovered. The effect of the trial will undoubtedly be to cause a prompt inspection of these properties now that the Government has been aroused to take action.

Larder Lake generally is in a bad way. According to the report of a recent visitor all operations on the Blue Bell and Lucky Boys, two of Law & Co.'s flotations, have ceased and the shaft of the Blue Bell at Spoons Bay is full of water. The Larder Lake Proprietary Gold Fields has suspended operations for lack of funds owing the workmen three months pay. A party of them were met returning to civilization destitute even of money to buy meals. At the Harris-Maxwell, one of the more promising mines of the camp, some work is being done. An exploratory adit is being run 120 ft. near the water-level to cross-cut a dike, the company waiting until the snow flies to bring in machinery. The dike material shows a small amount of galena and iron pyrite and occasionally free gold.

A number of new finds have been made at Cobalt recently. At the Silver Leaf a silver calcite vein with a surface width of 2½ in. has been discovered at about 5 ft. from the main vein. The shaft on the latter is down 45 ft. and a carload of ore, one-half of which is high-grade, has been taken out.—A vein of cobalt and smaltite with silver contents has been found at the Bailey Cobalt in No. 1 adit. In the course of driving at the 115-ft. level in the Cobalt Central a cross-vein 6 in. wide carrying niccolite, smaltite, and silver was struck. Ore shipments for the week ending Nov. 2 were 237 tons; Foster 33 tons, La Rose 124 tons, McKinley-Darragh 60 tons.

The British Canadian Smelters Ltd. has begun the treatment of Cobalt ores in Toronto, two carloads having been forwarded from the La Rose mine. They claim to have a new and economical process, but the noxious fume proved an unsatisfactory feature, as the establishment is situated in the business centre. As the result of complaint to the authorities, they were fined \$50 and costs. The company has asked the city for a site in Ashbridge's marsh and in return for a grant of 25 acres it is now stated that they will erect a smelter employing 500 men.



A Part of Ontario, Canada.

constitute the firm of Law & Co., mining brokers, who floated several Larder lake companies, including the Blue Bell, Lucky Boys, and Highland Mary, all with big capitalizations, and shares marked down to bargain-day figures.

The present action relates solely to the Highland Mary, which has recently been extensively advertised, the stock being offered at 10c. per dollar share. The information charges the defendants as directors with issuing prospectuses that failed to contain the particulars required by law as to the price paid for the property, amount of promotion expenses, commissions, etc. The company was capitalized at \$3,000,000 in one dollar shares and purchased from Frank Law, the principal promoter, 30 claims at Larder Lake, giving him \$2,000,000 in

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

A MULE LOAD is from 200 to 300 lb.; a burro load, 125 to 200 lb.; a llama load, 50 to 75 lb. Loads are made up in packages of 25 to 50 lb. each.

A NOVELTY in tin-ore dressing in Cornwall is the use of the Ferraris ball-mill for crushing the ore. A single mill crushes 2,240 lb. of ore per hour to pass a 30-mesh screen, requiring seven horsepower.

MANY HOISTING-ROPEs in Western Australia are condemned on account of internal corrosion. The Government Engineer advises the practice of opening the rope to examine it before condemning it. During the year only one rope actually broke.

A GOOD FUSE should burn at the rate of 80 to 100 seconds per yard. One that burns faster or slower than this should be used with caution. A fuse that snaps when burning, should be immediately condemned. A consignment of fuse should always be tested for regularity and speed of burning before it is approved by the mine superintendent.

THE *Lusitania* in her last voyage, ending at New York on November 8, made the Atlantic crossing in 4 days 18 hr. 40 min., which is the record, being 1 hr. 40 min. better than her previous performance. The best day's run was 618 knots. She encountered a severe storm, the waves being estimated at 50 ft. in height. This is tremendous, as experienced travelers know.

ELECTRIC PUMPS are now used at the Lindal Moor iron mines at Lindal-in-Furness, England. A 3,000-volt three-phase current is used. The special feature of this plant is that, although there are several motors underground, each of these is under the control of the powerhouse engineer; the starting and stopping of each and the throwing in and out of the resistance coils are effected by means of the switch-board apparatus. By means of indicators the engineer can judge the state of affairs at each motor.

ORIGINALLY gold mining in Russia was allowed to all persons enjoying legal rights of citizenship, Russian subjects as well as foreigners. But in 1885 this was restricted so that an exception was made of the 'Sea Region' (the shores of Tatarski Strait and the Japanese Sea, as well as the Sakalin), where Russian subjects only were allowed to mine. In 1902 the law was modified so that foreigners are again allowed to mine in this region, except for the strip of land 100 versts wide along the coast in this, the 'Sea Region.' At present there is an agitation in Russia to remove even this restriction.

AN interesting use to which gypsum is put, especially in England, is the 'burtonization' of beer. The reputed excellence of certain British beers, notably those of Burton and Newark, is attributed to the presence of calcium sulphate in the natural water used in their preparation. It has been calculated that 350,000 lb. gypsum are annually imbibed in potations of Burton beer, and since gypsum is soluble to a certain extent, attempts have been made with varied success to add similar artificial salts to water not derived from gypsum-bearing beds, and large quantities of gypsum are purchased by brewers in England for this purpose. This addition, although advantageous, does not produce so perfect a combination of

salts as that existing in the natural waters of Burton-upon-Trent.

THE Kolar district in Mysore, India, is characterized by narrow rich veins of gold ore. The ore occurs in a band of schist in a granite country. There are two principal lodes, the Champion and the Oriental. Mining on the Champion lode has been successful, that on the Oriental not. One of the mines has been opened to a depth of 3,000 ft. on the incline, others to a depth of 2,000 ft. The veins vary from 1 to 5 ft. in width; the ore mined averages a little less than an ounce gold per ton. The Champion lode is characterized by the great continuity of its ore-shoots in depth. Apparently the veins in this district increase somewhat in width with depth.

IN prospecting an orebody it is well to follow the vein until the amount of ore developed warrants the expense of more direct means of access to it, such as a vertical shaft or an adit. On the other hand, staying with the ore can be carried to an extreme in the case of a developed and paying mine. It is always good policy to drive occasional cross-cuts into the foot-wall and the hanging wall in order to prospect them. If these cross-cuts are judiciously placed, the waste rock coming from these can be used to good advantage as filling and the real cost of this prospecting, owing to the saving in the cost of filling due to this handiness, will be somewhat diminished. Butte owes as much of its development to cross-cutting as it does to sinking and driving. Tons of ore in unsuspected places were found in the 'legal' cross-cuts—those forced upon the participants in the Heinze-Amalgamated litigation. The Cœur d'Alene owes much of its greatness to 'blind' lodes which have been developed by cross-cutting. Once there was only one vein at the Waihi mine in New Zealand, now they are prospecting 20 veins in that property, most of which have been found by cross-cutting. Similar cases are to be mentioned in all parts of the world. Wild 'tunnel' schemes, so loved by promoters, of course are to be condemned. Leaving the ore to hunt for your mine does not pay, but it does pay after you have developed your mine, to cross-cut in order to see whether or not another mine is at your very door.

IN coal mining the relative merit of exhaust fans and blowers is still a debated question but in metal mining, where their use is confined at present to ventilating hot stopes or long drifts, there is not much question which is the better in each case. The blowing fan sends a quantity of fresh air into the stope or working; this mingles with the foul air and slowly passes out of the working. The suction fan draws the foul air out, picking it up close to the face where it is most injurious to the miners; fresh air comes in to fill the partial vacuum and takes the place of the foul air. In driving a long drift the chief source of pollution to the air is at the face where the smoke and gas, at the time of blasting, and the gas, occluded in the pile of broken rock and given forth later when mucking begins, are the chief causes of vitiation. Consequently for such work it is best to use a suction fan, as it takes away the polluted air as fast as it is formed. A blower simply blows the gas and smoke away from the face where it hangs and bothers the trammers and others. In the case of a hot stope the object is to get fresh cool air to the men at the faces. In such a case a blower is the best, for it sends the air rapidly through the pipe leading to the face, so that it has little time to become heated, and delivers it where it is desired. In the case of a suction fan the velocity of the in-coming current is so slow that it is as hot as the air going out, and the stope is as unpleasant as if no fan were running.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

Green Gold.

The Editor:

Sir—I read Mr. Leach's letter and your remarks in the issue of September 21 with interest because, although I have often heard of green gold, I have never seen it except in the form of thin leaves and had begun to doubt its existence. My own observations on the silver-gold alloys (*Proc. Roy. Soc.*, Vol. 71, 1903, p. 161) satisfied me (1) that silver and gold form perfect mixtures in all proportions and do not form any compound; (2) that there is a perfect gradation of color from yellow to pure white as the proportion of silver increases from 0 to 60%, and that the color does not, according to my eyes, pass through green. Nevertheless, my faith in the observations of others has been strong enough to make me invariably describe alloys of gold and silver as of a "greenish-yellow" color. I write now to ask Mr. Leach if it is possible that a cast and rolled alloy never shows a green color unless it is subjected to some pickling process, which somehow converts part of the gold near the surface into the well-known violet or purple condition? A little violet would, of course, turn yellow into green. The part played by the silver would then be indirect.

T. K. ROSE.

Royal Mint, London, October 15.

Cost of Filtering.

The Editor:

Sir—In your issue of October 26, 1907, under the head of 'Concentrates,' a description of the installation and operation of Moore's filter-press at the Waihi mine, in New Zealand, is given, and the statement is made that the running costs of the filter are less than 2 cents per ton of ore treated. According to the figures given, \$18.28, the total cost of treating 220 tons per 24 hours figures out at the rate of 8.3 cents per ton treated. I think if this 2 cents per ton referred to other than the tonnage of slime treated, as the cost of filter-pressing against the total tonnage of ore, reference would have been made to the ore tonnage before giving the costs.

E. BURT.

El Oro, Mexico, November 5.

Cyanide Practice at Copala.

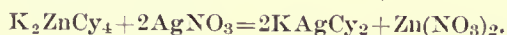
The Editor:

Sir—In the issue of the MINING AND SCIENTIFIC PRESS of June 8, under 'Cyanide Practice at Copala' occurs the following: "In regard to the testing for alkali, we first determine the free cyanide by titrating with standard silver nitrate solution to the first faint opalescence without the use of potassium iodide indicator; we then add a few drops more of the silver nitrate to make the opalescence well defined and titrate with N/5 oxalic acid solution using phenolphthalein as indicator * * * It has been found to check closely with L. M. Green's ferrocyanide method * * * it has been adopted on account of its simplicity."

L. M. Green's ferrocyanide method has been in use here for determining 'protective alkali.' The oxalic acid method, given above, fails completely on our mill solutions. Addition of phenolphthalein, after titrating cyanide solution, to faint opalescence, with normal silver nitrate, leaves the solution white and opalescent. L. M.

Green's ferrocyanide methods gives 0.14% protective alkali on this same solution.

The oxalic acid method fails upon solutions which contain much K_2ZnCy_4 as zinc nitrate is formed. According to equation:



This can be presented by adding an excess of potassium ferrocyanide; but what then becomes of the boasted simplicity of the method? Another objection is the fact that dilute solutions of oxalic acid are unstable. When a method for analytical tests is given, it should be complete. It is not complete, unless its limitations are given.

DANA G. PUTNAM.

Gould, Montana, October 24.

Tube-Mill Lining.

The Editor:

Sir—Referring to your issue of October 12, page 466; an article on 'Lining for Tube-Mill.' Had not a rather lengthy article been brought to my notice in the issue of another technical journal just received, I would not have felt justified in commenting at present upon the device mentioned in that article, in which is given results of the excellent work done through the use of the lining. Inasmuch as I have known the fairness with which you have always handled such matters, I beg to suggest that you will again give credit to him to whom credit is due.

While I may be wrong in my supposition, still I have seen fit to enter my protest against the use of this device, or at least the assumption of the credit which might possibly be due to others. That I am justified in claiming this device to be my own, I beg to refer you to Mexican patent No. 6,354, issued to me under date of February 22, 1907, which patent recites my claim to what I designate as the Hardinge conical pebble mill now undergoing practical experiments for definite and positive efficiency.

One of the claims of this patent covering the device for a self-forming tube-mill lining reads as follows:

"Un aparato para triturar materiales frágiles que comprende un barril ó tambor, uno ó ambos de cuyos extremos son cónicos, estando un extremo provisto de una entrada y el otro de una salida, y estando la superficie interior del barril provista de proyecciones longitudinales entre las cuales se alojan los trozos ó piezas del material que se está triturando ó los cuerpos trituradores que se emplean para ayudar á afectar la trituración, ó ambos, los cuales constituyen un forro que protege el interior del tambor ó barril y que se renueva constantemente por sí sólo tal como en substancia se ha expuesto."

Which being interpreted reads:

An apparatus for disintegrating friable material, comprising a tumbling barrel or drum having one or both ends conical, one end having an outlet, and the other end an inlet, the inner surface of the barrel being provided with longitudinal ribs or flanges between which lumps or the pieces of material undergoing disintegration become lodged, or crushing bodies employed to assist in the disintegration, or both, forming a lining which protects the interior of the barrel or drum, and constantly renews itself as set forth.

If I am claiming more than is my due, our El Oro friends must show that this device was in use previous to my original application for the patent on the same, made about a year since.

The original idea of this device occurred to me through the finding of pebbles of all sizes lodged firmly within any open recess of the tube-mill; more particularly, I found pebbles so firmly imbedded within the splayed edges of the siliceous bricks, that it was impossible to remove them without considerable force being applied, which observation I utilized as above stated.

Mexico is the first to publish my patent; I have pur-

posely withheld publicity as much as possible until I was ready to make a positive statement; for, as you are aware, the mining or metallurgical engineer must deal with facts as he knows them, and not state suppositions as facts, when based on laboratory experiments alone.

H. W. HARDINGE.

New York, November 1.

Professional Customs.

[The questions to which reference is made in these letters will be found in our issues of October 5 and 12.—Editor.]

The Editor:

Sir—In offering the following replies to the questions of T. S., I am giving an opinion formed from a practice which has been largely for investors living in the north-eastern part of the country. Customs doubtless differ in different parts, and consciences also, I suspect.

1. A fee is preferable whenever possible. Both client and engineer have the satisfaction of knowing what the work is to cost at the outset, and the engineer has no fear that he may be suspected of 'putting in time' to increase his stipend if he stays over an extra day to study those minor details which so often seem inconsequent, but may finally be the deciding factor. On certain lines of work, as a small isolated property to be pumped out in the presence of the engineer, with the possibility of caved ground to be opened, when it is impossible to see whether the work will take four days or forty, and the value of the property is too small to justify a fee to cover the latter condition, a *per diem* rate is more satisfactory.

2. Certainly, it seems more businesslike to have a contract, but it is rarely done here, when the engineer engages for a single examination. If he is to act for a considerable period, or is to have an interest in properties purchased, a contract is signed.

3. It is customary in this part of the country to have expenses advanced. Many examinations are made for people of no financial standing, and the fee is also deposited in bank before the work is begun. A man living in Boston may leave for the West and Alaska for a series of examinations, the aggregate expense of which will be several thousand dollars. It would, to say the least, seriously inconvenience most of us to advance this out of our own pocket, while the refund, even if promptly made as soon as the statement for the first examination was submitted, might not become available for the engineer in Alaska until the season was nearly over.

4. An engineer should certainly own those tools and instruments such as are necessary for the proper accomplishment of his work, as the aneroid, compass, camera, etc. Surveying instruments may or may not be included in this, depending on the class of work a man is doing. A good surveyor can be had for \$10 per day and it usually is more satisfactory to engage one near the property, if necessary to do work of this kind. Maps of the property are frequently furnished and may generally be accepted as correct after going through the workings and making a few measurements to check them. Some of the older engineers occasionally make their own assays, as do also some of the younger, but we are no longer expected to have our own assay-offices. Other equipment is charged to the company. If sold at the end of the trip, as in the case of horses, the company is credited. I question whether a man could charge up a fur coat, but I have charged for hip rubber boots when I had to wade daily through a tunnel carrying two feet of ice-cold water, turning them over to the company afterward.

5. With regard to the expenses mentioned under (a), I believe army officers are allowed about 65 cents per day

for tips. In certain Government departments ammunition is not allowed, *per se*, but goes through all right when charged under the head of 'fresh meat.' It would seem that there should be a distinction made in the case of ammunition, entertaining, etc., between expense incurred for the pleasure of the engineer and that for the benefit of the company.

(b and c) A man cannot do good work if he is not in good condition, and this is especially so in the case mentioned where work is to be in the tropics. An engineer who does not give his company the best there is in him is not worthy of the name. Any man who charges for expenses not incurred is a thief, be it traveling accommodations, or for labor, in the shape of padded payrolls.

Other questions under No. 5 must be largely answered by specific agreement in each case. Young commercial travelers are not ordinarily allowed to charge up shaves, shaves, hair-cuts, and baths, while older men who have demonstrated their worth may entertain in private dining rooms at company expense. There is a similar variation in the case of engineers. It is well in these days of investigations to do nothing which cannot be told on a witness stand without detracting from one's reputation. Of course it is business-like to take vouchers, whether demanded by employers or not, from laborers, assistants, and merchants.

6. Periodical reports to employers who are not familiar with mining are often a source of trouble. First impressions are not easily overcome and a few poor assays, received at the start, may result in the turning down of the property by a company even though the engineer may strongly recommend it in the light of complete results. Of course a company may demand anything; and the engineer has an equal right to decline to make the examination.

In answer to 7, 8, and 9, it may be said that there are many things which may be legitimately done under a specific agreement. I may, with my neighbor's permission, enter his orchard and help myself to his apples. If he is willing, I may go before he has a chance, himself, and take the biggest, rosier ones. If his trees hang over the wall toward the road I may gather apples that have fallen there, and then go and tell all the world what glorious fruit may be found in this place. All this would be legal, with the owner's permission, some of it without. But we cannot imagine those men whom we delight to honor as leaders, and as exponents of what life should be, taking the best apples before the owner had a chance, even *with* his permission. Now if a carpenter was employed to make a ladder so that the owner might pick his apples, and was paid in advance for it, and then the carpenter used that ladder, without permission, to mulch the orchard, and owner, of the juiciest fruit, there would certainly be trouble. Verily, what a farce this is when brought down to everyday affairs; to apples in place of stocks! May T. S. never tell what school he comes from lest his questions reflect on its lack of moral tone! And yet, how may one mingle with the commercial world and not have such questions arise?

As T. S. says: "Each individual case introduces diversified conditions." An engineer, returning from an examination in Sinaloa, finds himself at Altata and no boat due for a week. He takes a trip to a near-by district, examines and options a prospect, paying all expenses himself, and returns in time for the boat. His clients have lost nothing, but as they paid the expense of his trip to Sinaloa they should have the opportunity to take the prospect? If they are not looking for additional property I should say the engineer might then take the property to others.

Similarly of No. 9 it must be said that conditions gov-

ern what may be done. Many a small company, operating in a new district, is glad to have information published because it leads others to investigate, resulting in the operation of neighboring properties, more business in the district, and better labor, freighting, and mail conditions. On the other hand, if a company wishes to acquire as much ground as possible for itself, the less said about the district the better. Whatever is written should be submitted to clients before publication.

10. Many demands for an examination are not in a form to be answered by 'Yes' or 'No.' An engineer on the road often receives a telegram like this: "Proceed to Pioche at once and examine Daylight mine. Wire summary of report as soon as possible." Such a message requires a statement of facts concerning development, values, equipment, and general mining conditions. Reports of this type are common for clients experienced in mining who are competent to reach their own conclusions. Other examinations are made because the owner wishes advice as to development and equipment. Often these are for small companies that have been led into some scheme by an optimistic promoter or prospector who has been put in charge of the work and failed to produce dividends as promised. Frequently an engineer has to report to an investor that a property does not justify the price asked but would be worthy of purchase at a smaller figure. Or he may report that a prospect does not justify purchase at all, but does show values and geological conditions justifying development if a bond can be had. In this case the development to be done should be specified.

Unwatering, or opening caved ground, is ordinarily done by the vendor, or by agreement beforehand. An engineer is not expected to wait until a mine is made. I should say he would be justified in expending but little for the purposes mentioned, without definite authority.

GEO. A. PACKARD.

Boston, October 24.

The Editor:

Sir—In your issue of the 5th ult. there appears a communication entitled 'Searching Questions.' In it occurs a paragraph "If we could get answers to some of the questions from several men, we might deduce a series of useful rules." I take pleasure in contributing my answer for such percentage of service as it may afford toward the deduction of this series.

The ten questions all seem to be predicated on the assumption that the examination is to be made by a comparative novice, and my answers will be made on that theory.

Whether a straight fee, or a *per diem* charge shall be the basis of the remuneration must depend upon the nature of the case. If the young engineer feels that the benefit to himself in experience and information gained will be of more importance than the money consideration, he would be justified in accepting what the contracting party is willing to pay, which would generally be a predetermined fee. The size of it will depend upon how good a trader he is. If the transaction is on a purely business basis a *per diem* should be charged. That leaves the extent of time devoted to the work to be settled after the engineer finds on the ground what the actual conditions are.

All business agreements not closed when made by cash, note, or acceptance (or its equivalent) are based upon contract, expressed or implied. The prudent business man always reduces these contracts to writing. Then each side understands the terms and can always refresh the memory, which is proverbially treacherous. A

young engineer who attempts to do important work without such written contract is inviting trouble.

All the probable expenses of the trip should be in bank to the irrevocable credit of the young engineer before he starts on his trip. The engineer "starting from Colorado bound for the tropics" who adopts any other course is courting an opportunity to become acquainted with some Spanish American jail.

"All the equipment necessary for the work, outside the personal expenses of the engineer," excepting the technical literature and apparatus, which every mining engineer should own, should be paid for by the party hiring him and should be the exclusive property of such party. If sold when no longer needed the amount realized should be credited. Every engineer ought to own a barometer, transit, tapes, and a camera, but it sometimes happens that it is better to hire for the purposes of the examination. In that case the rent is properly chargeable, as a rule, to the party for whom the examination is made. The reason for this charge, however, should be explained.

Tips, laundry, tobacco, ammunition, whiskey (in moderate quantity) are proper items of expense.

If the engineer regards himself as a first-class man he is entitled to associate with men in his class on the trip. Such men always travel first-class. His time on the trip belongs to his employer. It is his duty to travel in such way as to make that time tell to most advantage. He is entitled to allowance for first-class accommodations. If without detriment to his efficiency he can travel for less than first-class cost, the engineer would probably be within his rights if he pocketed the difference, but he would be violating good ethics, and if the practice became known it would be decidedly to his discredit. This is a question upon which engineers differ, but all reputable ones seem agreed that the proper way is to charge for just what is paid out.

No positive rule can be laid down for the particularity with which accounts should be kept. Such items as meals, street-car fares, porters, shoes shined, shave, hair cut, and tips to waiters could be lumped by the day. Telegrams should be kept separate. Vouchers should be taken for such expenditures as vouchers are ordinarily given for, as hotel bills, supplies, and wages. It is not customary to take vouchers for railroad tickets, meals at restaurants, or porters. The more businesslike the expense account, the more satisfactory will it be to the employer, as a rule, and the careful engineer will try to establish a reputation for doing everything carefully and thoroughly. The engineer is sent after information. If he has to pay to secure it the expenditure should be entered on his cash account, whether it be for wages, official fees, money paid out for meals, drinks, cigars, livery teams, fandangoes, or what not. He is sent to secure information and trusted to use his discretion; and his employer agrees to pay the bills.

If the expedition is to last three months the question of when accounts should be rendered should be settled in the contract. In the absence of special provision for periodical expense accounts, they should be rendered with the report and final bill. It is best to keep closely in touch with the employer and to furnish him with such information as he desires as often as he desires, in reason.

The question of what an engineer may do to advance his own interests, whether in buying shares, mining ground, or anything else of value, of publishing information, etc., depends upon what effect any such conduct might have on the employer's interests. These interests it is the duty of the engineer to protect. If, doing that to the fullest extent, he can serve his own as well, it is his privilege.

To the broad question, "Is it permissible to use information gained at company expense for private gain, during or subsequent to the term of employment?" the answer must be: "Yes, decidedly." It may have been for that very purpose that the engineer has accepted the commission.

Question 10 is too indefinitely stated to justify an answer. If the employer's question is: "Shall I take hold of this property?" The engineer must give positive advice. If the question is: "Is this property worth \$100,000?" the engineer must answer: "Yes," or "No; not so far as has been disclosed to date."

"What the engineer should do when the mine is old, caved, and full of water must be determined by his contract and instructions and not by any series of useful rules.

JAMES W. ABBOTT.

Pioche, October 17.

The Mine-Foreman.

The Editor:

Sir—In the matter of 'Deep Thinking and Fast Sinking,' I would like to put in a plea for that class of men who rarely, if ever, get a word of praise or recognition in the scientific papers when anything in the shape of a 'record' is being mentioned in connection with mining. I refer to the mine-foreman. I venture to say that the gentlemen singled out as deserving special mention (Messrs. Brodigan and Simpson), would themselves acknowledge the brunt of the work in creating the 'record' was borne by the foremen, then in all fairness I ask why should he not have the credit? It was he who had to supervise and personally direct the working of everything from the time the holes in the shaft were started until they were blasted and mucked out. Speaking from ten years' experience, there are very few general managers who would be worth their room in the bottom of a shaft planning holes and handling men, yet when a good showing is made the G. M. gets the 'write-up,' and the foreman is not even mentioned. I would also heartily endorse what Mr. P. S. Williams says, namely, that one has to take the conditions into account to judge whether or no the record is an exceptional piece of work. As an example I would state that during my career I have had charge of operations where we sunk 110 metres in less than three months, but I do not consider it such an accomplishment as that of another instance where we were 10 months sinking a bare 25 metres. This shows that good measurement is not much of a criterion unless the conditions are considered along with it. Under the plea then of rendering unto Caesar the things which are Caesar's, I would ask that a fair share of the credit for rapid shaft-sinking be given to whom it is due—the mine-foreman in charge of the work.

T. SKEWES-SAUNDERS.

Ejutla, Oaxaca, Mexico, November 4.

[We take particular pleasure in publishing the foregoing letter. As good managers, none will be more apt to recognize the economic value of an efficient and loyal foreman, than the two engineers that made a record in shaft-sinking. It is an important function of a good manager to know how to select efficient foremen and shaft-bosses, just as a successful general knows whom to put in command of his brigades.—Editor.]

THE Government of Western Australia has set aside six special detectives to watch the illicit traffic in stolen ore and gold at Kalgoorlie. These men are paid by the Chamber of Mines. It is hoped thus to check 'high-grading.'

Diente, Mexico.

Written for the MINING AND SCIENTIFIC PRESS
By E. McCORMICK.

This camp is situated on the northeast frontal scarp of the Sierra Madre, about 12 miles southwest of Monterrey; here are situated the San Pablo, San Pedro, Zaragoza, and a few other mines of lesser note, the district being reached by a narrow-gauge railroad known as the Mineral Belt.

The mountain is made up of massive limestone, the front being a straight scarp overlooking the valley. The rocks of the region are entirely sedimentary, consisting of shale and limestone, the latter generally gray and made up largely of fossil mollusks. The stratification dips southwest at about 78°, but toward the southeast it flattens to a more nearly horizontal position. The rainfall is large, hence the mountains are riddled by water-courses, but, as there is no material to impede a downward passage, the water-level is low. The ore-shoots are parallel to the mountain slope, hence the tendency is to keep the ore above ground-water, removing thereby the zinc and most of the iron and bringing about a marked diminution in the bulk of original ore, which is soft, porous, and light, causing it to sink and contract, so as to leave vacant spaces above. These water channels depend on the fractures in the rock, the zone of fracturing being as a rule only a few feet wide, weak, and in different directions. The ore is very irregular in shape, so that the only advisable method of development is either to follow the fractures of the ore-zone underground or to prospect at the surface. This zone has three lines of fracture, namely, those parallel to the stratification, transverse to it, and horizontal. The intersection of two of these produces a chimney-like shoot, such chimneys being the watercourses where the circulating waters have deposited ore at the intersections.

All the profitable ore of the camp is above the ground-water, the unaltered ore found below being pyrite, blende, and galena, usually badly mixed, hence unfit for smelting; eventually they will, no doubt, be concentrated. The primary ores have been dissolved and re-deposited as carbonates and oxides, chiefly of lead and zinc, the iron being as oxide. Such lead ore as is at present mined contains about 100 grams of silver and from 12 to 20% lead; when wet, it is a clayey mud, but on drying it forms a soft sand. All gangue material foreign to the rock is lacking, only calcite being found.

The limestone southwest of the ore-bearing stratum is dense, fine-grained, impure, and contains nodules of pyrite; the outcrop, although heavily iron-stained, gives no trace of lead or zinc. Under conditions of alteration, zinc, being more soluble than lead, would naturally be carried farther downward in the zone of oxidation and such a mineral has been found in the lowest part of the workings lying parallel to the walls of the orebody, sometimes distinct from the lead and again in the same stope, as a coating intervening between the lead and limestone. This zinc carbonate runs all the way from 3 to 35%, the higher grade being shipped direct to the United States, while the lead ores are smelted at Monterrey. The camp is a prosperous one, but for the past year labor has been scarce, hence wages have increased from 20 to 25%, the present rate for miners being P1.25 per day.

GAS-ENGINES and GAS-PRODUCERS are used to furnish power to the Waikino mill being built at Waihi, New Zealand. Coal is burned in gas-producers and the producer-gas is piped to the gas engines, which are placed wherever desired. The coal-tar by-product is saved and will help considerably in decreasing the cost of power.

Smelter Smoke, With a Discussion of Methods for Lessening Its Injurious Effects.

Written for the MINING AND SCIENTIFIC PRESS
By L. S. AUSTIN.

Anyone accustomed to smelting conditions as they formerly existed in the Western States, is astonished to learn that at the Freiberg smelting works in Germany, which treated but 70 tons of ore daily, complaint was made of the detrimental effect of smelter smoke, and the Government required sulphuric acid works to be erected at the expense of the smelter in order to get rid of the sulphur fumes. In the early experience of silver-lead smelting in the West, oxidized ores only were treated, and later when some roasted ore was added to the charge, the amount of sulphur was relatively small. The matte that was formed was heap-roasted and the smoke from the matte piles, practically containing sulphur dioxide only, caused little complaint. Sometimes the smoke would have a blighting effect when the wind was right for it, and the atmosphere was smoky to the leeward of the piles. Later, as the sulphide ores increased in quantity, they were roasted in hand or machine-rabbed reverberatories, and the fume was discharged from a stack, and thus became so diluted that it was not detrimental to vegetation. With the construction of large works treating thousands of tons of ore, the problem has greatly changed. The commonest ore of copper is chalcopyrite, which for proper self-roasting should contain (as much of it does) 25 to 35% sulphur. This is not the only drawback. At certain works not only is there sulphur dioxide, but arsenic, to contend with. While the latter cannot be called detrimental to vegetation, still it is poisonous if it falls in sufficient quantity upon vegetation which is to be used for forage. Again, the solid particles, or so-called flue-dust, falling upon the leaves of plants, may seriously injure them. The production of these substances is as follows:

In both lead and copper blast-furnaces the blast, coming up through the charge, makes a good deal of dust, and this in part settles in the flue that leads from the furnace to the stack. The velocity of the escaping gases is, however, too great to permit the settling of the finest particles. In the case of lead furnaces some lead is volatilized and upon cooling, a portion of it condenses upon the surfaces of the flue. The amount of SO_2 produced in lead smelting is not more than 0.2 to 0.5%. The fumes from a copper blast-furnace are different in constitution. They contain whatever arsenic has existed in the ore, and sulphur dioxide varying from 0.9 to 2.5%. (At the Washoe plant, Anaconda, it amounts to 1.5%.)

The fumes from roasters are largely SO_2 (up to 2.5%) produced by the burning of the ore, together with some dust caused (in the case of the McDougall roasters) by the fall of the ore from hearth to hearth, to the agitation due to the rabbles, and to the draft through the furnace. This dust settles in the flue leading to the stack.

In the case of reverberatory furnaces the charge is dropped upon the hearth in a body, so that comparatively little flue-dust is made. Some SO_2 develops as the result of certain reactions, indicated by the frothing or bubbling of the charge as it is melted. At the Washoe plant the percentage formed was 2.08 during the first ten minutes after charging. It drops to 1% during the succeeding 80 minutes of melting. Ebaugh gives the SO_2 as being but 0.01%, but this must be after the early reactions, and from furnaces where the charges are much more slowly treated.

The smoke, upon leaving the stack, is more or less dissipated according to the velocity of the wind. In still weather it rises rapidly and seems to be carried away at

a great elevation. With a moderate breeze it rises slantingly, but fills the air to leeward, while in a high wind part of the smoke will come to the ground at the base of the stack. And thus by this threefold action of the aerial forces, the upward-driving gases in calm, the buoyant but drifting smoke clouds in a moderate breeze, or finally the tumultuous energy of the gale tearing them apart, so that in any case they are dissipated and diffused through a mass of cubic miles of air, all contribute to act intermittently only upon a given area of the soil, so that relief comes to the harrassed vegetation, that it may make fresh effort to resist the next oncoming attack. It can be estimated that at one mile away, allowing 1.5% as being present in the escaping gases, the dilution (and not counting diffusion) will be such as to give 20 parts of the gas in a million of air.

Prof. Ebaugh has published an article in the Journal of the American Chemical Society, July, 1907, entitled 'Gases Against Solids, an Investigation of the Injurious Ingredients in Smelter Smoke' and thinks that "too much emphasis has been laid upon the injurious effect of SO_2 , and too little upon the harmful action of the solid constituents (flue-dust)." He finds the blighting action is greatest in wet weather, least in dry. The losses of crops are not total but partial, and vary from year to year.

Analyses made for SO_2 in the air at distances varying from one to seven miles from the smelting works showed no gas in 60% of some 500 cases examined:

60% contained.....	no gas
12 "	1 part of SO_2 in a million
20 "	2 to 3 " " " " "
6 "	4 " 6 " " " " "

leaving 2% of cases in which were found 7 to 10 parts of the gas in one million parts of air.

Upon passing air containing 1.5% of SO_2 over water to the point of saturation, the water at 90° F took up 0.33 volume of the gas per volume of water, and proportionately less as the air was weaker in gas. There is therefore but little chance of the gas when dissolved in water acting injuriously.

Hazelhoff and Lindau, German authorities, give the following conclusions regarding the action of SO_2 and SO_3 on plants:

- (1) No injury results to the soil nor to the roots of plants.
- (2) The gases act by contact on the leaves of plants, and analysis shows that the sulphuric acid content is greater than in smoke-free plants.
- (3) The sensitiveness of plants to such action varies with the species and with individuals which may show special immunity (white pines are susceptible, while post and white oaks and red maples are very resistant. Between these come black, red, and black-jack oaks and yellow and scrub pines.—Haywood).
- (4) Sulphur dioxide, even a few parts in a million, will, with long continued action, produce an injurious effect on vegetation. Commonly such action is intermittent and so, less harmful.
- (5) The gas acts by wilting the leaves, spots appearing and the leaves eventually turning brown or black and dying off. The SO_2 is probably converted to H_2SO_4 by the oxidizing effect of the leaves having thus a corrosive action upon them.
- (6) The action of the gas is more injurious by day than by night.
- (7) The action of the gas is cumulative, hence annual plants should be less injured.

In regard to the flue-dust itself, a sample of such dust, taken from the top of a stack, contained as follows: Moisture, 4.1%; SO_2 soluble in water, 17.7; total SO_3 , 33.9; Fe soluble in water, 3.6; total, Fe 16.7; Cu soluble

in water, 1.6; total Cu, 4.2; SiO_2 , 28.5; PbO , 8; As_2O_3 , 13; ZnO , 15%. This analysis indicates the presence of soluble and insoluble sulphates. Such flue-dust is hygroscopic, taking up water in a saturated atmosphere as follows: Original H_2O , 4.23%; after 12 hr., 10.21; after 24 hr., 12.05; after 48 hr., 13.09%. The corrosive power was roughly proportionate to the hygroscopic power. Dust, mixed with water, and sprayed upon sugar beets and alfalfa, showed severe corrosion. If, however, the dust was mixed with soil to the extent of 10% or less of dust, the corrosive action was small; with 20% dust in the soil the action was severe.

Thus the finely divided dust or fume from either copper or lead smelting works is extremely corrosive in its effects upon vegetation. Prof. Ebaugh finally concludes: "By no means is sulphur dioxide to be considered harmless, especially in an enclosed place and a moist climate, but we are forced, by the weight of evidence to the conclusion that heretofore undue influence has been laid upon the injurious effects of sulphur dioxide on growing plants, and that the solid emanations from the smelters, the so-called flue-dust, has been seriously under-estimated."

Haywood in an article entitled* 'Injury to Vegetation and Animal Life by Smelter Fumes,' says, in reference to the presence of arsenic at the Washoe plant, Anaconda: "Ores there treated contain in three instances As 0.51%; As 1.17%; and As 2.54 per cent."

He found upon the leaves of plants which were to be used for forage:

Bunch grass	2 miles north of smelter	78 parts As in a million.
Red top	4 " northeast " "	21 " " "
Bunch grass	3 " east " "	32 " " "
"	6 " west " "	42 " " "
Alfalfa	10 " northeast " "	52 " " "

This corresponds, on a ration of 20 lb. daily, to from 3 to 11 grains of arsenic. However, it does not follow that this amount of flue-dust *remains* upon the grass, since because it is soluble to the extent of 90% and upward, rains may remove it, and particularly in harvesting, because of the frequent handling in curing, hauling, and stacking, the larger part of the dust would be shaken off the hay before it was fed to the cattle.† We may conclude, therefore, that in those localities where smelters do injury, farmers should adopt the soiling or stall-feeding system.

The smelting companies have been compelled by the troubles they have had with farmers, to cast about for methods of avoiding these difficulties, and have worked out the problem in different ways. As I have elsewhere stated, the farmers may be divided into three classes:

First, those who do not feel they are damaged.

Second, those who honestly believe they are.

Finally, those who, while they do not believe it, make claims for the money there is in so doing. In Germany, for example, damages have been collected by cultivators, who have set out their grounds with expensive ornamental flowers unsuited to the climate, and which have no chance of prospering, in order to profit by damages for destruction by smoke.

The remedies that have been proposed may be thus enumerated:

(1) Manufacturing the SO_2 into sulphuric acid to be sold as an article of commerce.

(2) Operating the smelting works in a barren country where the fumes will do minimum damage.

(3) Roasting the ore where the country is barren, thus removing most of the sulphur (to 10% or less) from the

ore, then treating the roasted ore at a works convenient to labor and supplies.

(4) Roasting the ore at a works convenient to labor and supplies, discharging the resultant SO_2 by a high stack, then smelting the roasted ore, but filtering the fumes from this last operation by means of a bag-house.

(5) Filtering all fume resulting both from roasting and smelting.

(6) Introducing plants and animals best suited to withstanding the fume; adopting stall-feeding in place of grazing.

(1) This method may do well where there is a sufficient market for the sulphuric acid produced by the works. However, a large part of, say, 1,000 tons of ore daily would produce acid in excess of any probable demand. Besides this, only such SO_2 as was produced in roasting could be utilized, while the fume and flue-dust from the smelting would still do injury and would have to be filtered out.

(2) This was adopted at the Garfield plant of the American Smelter Securities Co., at Garfield, Utah, 18 miles from Salt Lake City. The land, especially in the path of the prevailing winds, was bought up by the company, which then proceeded to the erection of an expensive plant for the treatment of copper ore. The fume was removed by a stack the top of which is at a level some 600 ft. above the works. The fume is thus diluted before it can touch land beyond the acquired portion. In a way, the experiment has proved to be an expensive one, since the company has been obliged to build a town for housing the employees; and at this distance from Salt Lake City, it is hard to get good labor, as well as hard to keep it. It is true that the company obtains a profit from its investment in the houses and in its town, but this is not the line of business into which it had intended to go.

(3) This method has been proposed where there are existing works that, because of the large amount of sulphur fume produced, have been serious offenders. If the ore can be roasted near the mine, for example, where the land is not used in agriculture, the damage becomes comparatively trifling, and the work of roasting requires but little labor. The operations of smelting and of converting the product can then be conducted where supplies and skilled labor are available.

(4) Prof. Ebaugh's experiments go to show that SO_2 gas alone may not cause radical injuries to plants and certainly not to animals, provided it is free from flue-dust. Indeed, according to Merrill's experiments* in the smelter zone, with stock properly fed and cared for, the animals flourish quite as well as elsewhere. If then the SO_2 gas from the roasters is allowed to escape freely into the air, it means that the main bulk of gases is thus disposed of. An ore containing 30% sulphur can thus be reduced to 7%. If we smelt and convert this roasted ore, we may easily filter the small volume now remaining to be hauled as referred to in method No. 3.

(5) At the American Zinc Works, near Canyon City, Colorado, the company has for years filtered all the gases from their roasters and blast-furnaces, the latter being purposely run to make all the zinc and lead fume possible. These gases are first cooled to the proper temperature, both by passing through sheet-metal flues and by the admixture of fresh air, then having been filtered at the bag-house, there is no smoke visible. This is also true of the bag-house installed in connection with lead-smelting plants. Where works thus provided deliver visible smoke, it is that coming from the roaster-stack. Even this can be filtered, but it is a more difficult problem, the bag-house needing to be fitted with the more expensive

* Journal of the American Chemical Society, July, 1907.

† Feeding Experiments with Forage Grown in the Smelter Zone. *Western Chemist and Metallurgist*, April, 1907.

** Feeding Experiments with Forage Grown in the Smelter Zone. *Western Chemist and Metallurgist*, April, 1907.

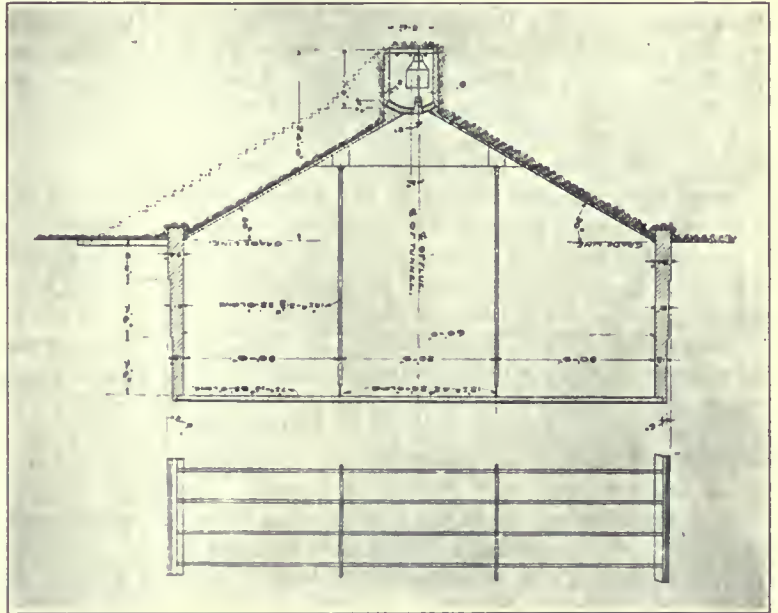
woolen bags, which stand the attack of the corrosive sulphates and sulphuric acid, and small as is the quantity of them produced, cotton bags would be readily corroded. Still, even in large works, all the fumes can be filtered. By so doing, not only the flue-dust but the arsenic can be got rid of. The flue-dust collected in the 'pits' at the bottom of the house contain a large percentage of arsenic, and such flue-dust is to be sent away where it may be safely treated, or the whole product buried, thrown into an abandoned shaft, or otherwise got rid of.

(6) It has already been shown that there is a great difference in the resistant power of plants to the fumes, and this power varies both with species and with individuals. Especially where the land is owned or can be controlled by the offending smelting company, it should be good policy to plant those species of trees most resistant to the smoke. Forage plants should be selected in the same way and cattle should be stall-fed, rather than be permitted to pasture upon them. Root-crops, as sugar-beets, should be raised, since while the leaves of these plants may be damaged, it will not be to the extent of preventing a profitable growth of the plant. As far as the forage plants are concerned, the damage to the leaves varies, and is often so slight as to make little difference in the value of the plant for fodder.

In conclusion, we may consider the findings of the Master in Chancery, Oliver Crane, to whom was referred the matter of damages due to smelter smoke from the

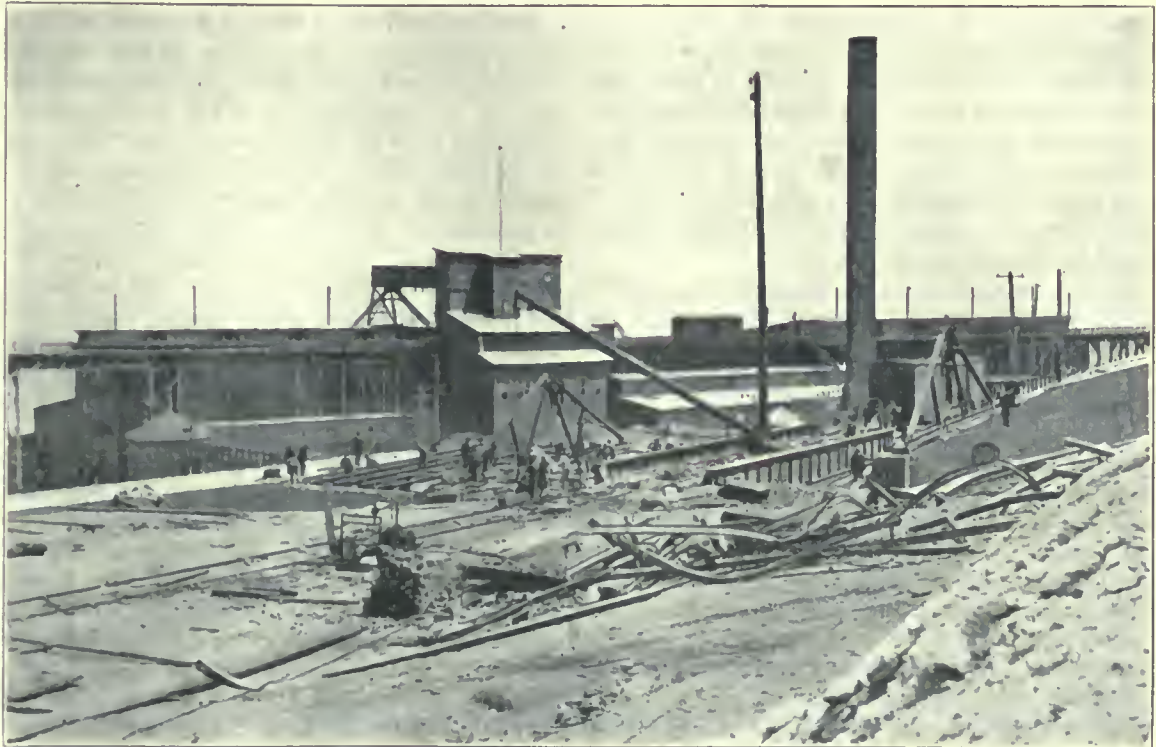
on a site where it will do less damage than any other available place, and that the company has always been willing to pay some damages.

FLORIDA continues to be the largest producer of phosphate rock in the United States. The output of the State for 1906 was 1,304,505 long tons, valued at \$5,585,578,



Cross-section of Main Flue at Anaconda.

against 1,194,106 long tons, valued at \$4,251,845, in 1905, and the percentage of the total production increased from 61.3% in 1905 to 62.4% in 1906, notwithstanding that the



Repairing the Big Flue of the Washoe Smelter, June 4, 1907.

Washoe plant. He finds that the farmers had been somewhat damaged by the arsenic, but not by the SO_2 contained in the smoke. He says that an injunction and the closing of the smelters would damage the farmers and the community more than a continuance of the nuisance complained of; that the company had been doing what it could to avoid damages, and that the smelter is built

year was a wet one and much trouble was experienced in the mines owing to the high ground-water level. The increase was confined to the hard rock and the land pebble, which increased in price respectively from \$5.18 and \$1.98 per long ton in 1905 to \$5.85 and \$3 per long ton in 1906. There was a falling off of more than 50% in the production of river pebble.

The Possibilities and Limitations of Geological Survey Work as Applied to the Mining Industry.

By GEORGE OTIS SMITH, Director of the United States Geological Survey.

*The year 1907 promises to mark an epoch in the mining industry of the United States. I refer to the probability that the value of the mineral output for this year will pass the two billion dollar mark. Last year was a record-breaker, with its mineral product valued at over \$1,902,000,000, an increase of 17% over the output of the previous year. Therefore, before I discuss the relation of the Geological Survey to the mineral industry, allow me to call your attention to the fact that in the first year of the Survey's history the value of the mineral product of the country, so far as known, was only about one-ninth of the present figure, and further, that now the value of the annual product of our coal mines alone exceeds one-half billion dollars, or, in other words, is more than twice the total value of all the mineral products in 1880. At this time we do well to consider whether this Federal organization has had any part in the national progress, and whether it intends to keep pace with the development of your industry, a development it has carefully recorded during these 28 years.

In any review of the development of American mining, the man behind the pick and the drill must be given his due; but motive power counts for little without knowledge to guide it. And I take it that the American Mining Congress stands for the intelligent guidance of the mining industry, and in this the United States Geological Survey heartily joins you.

In speaking to the subject assigned me, I ask for the Survey a fair recognition for its part in the past of American mining, and I promise for the Survey even greater endeavor to increase its usefulness to your industry in the future. In making this promise of future service I am conscious of the two fundamental limitations of a Government organization; the United States Geological Survey is the servant of the people along lines defined by the law of Congress, and both the direction of our progress and the distance covered are determined and limited by the appropriation act.

Limitation is but another name for boundary. What then are the boundaries of our field endeavor? Or, if you please, the endlines of our claim? Interested as I am in future development of the organization I represent, I believe we should not be asked to surrender extra-lateral rights, but only to show the persistence of the lode to justify further expansion of the work.

Congress has expressed the scope and purpose of this branch of the public service in its name. The words "United States" define its national character. In no branch of industry, probably, are State lines of so little moment as in the mining industry. A mineral product of fifty years ago might have been credited to a single State; but, today, by reason of development of transportation, with its influence upon financial operation and commercial interchange, the output of our mines and quarries not only reaches the markets of the world, but in many cases the marketed product is of interstate origin. Years ago a shipment of pig iron could be set down as the product of a Marquette county furnace using Michigan iron ore from the mines close at hand and Michigan limestone as well as charcoal from the neighboring hills; today, the blast-furnace in eastern Pennsylvania may use Minnesota ore, West Virginia coke, and

New Jersey limestone, and ship its product to California. Nor is the case at all different in the smelting of ores of the precious or other metals. Our smelters, whether in the East or the West, levy tribute upon the mineral wealth of many States and rarely can the best mixture of ores be obtained from a single State. Again, in the study of ore deposits the mining geologist, who, for instance, can continue his investigations year by year through a series of copper camps, has a great advantage over an investigator whose observations must be confined to the mines of a single State. This increase in opportunity means increase in value of results secured and published for the information of the public.

The collection of mineral statistics and the study of mineral deposits, then, must of necessity be made by an organization whose field is the whole country. As regards authority, the first Director of the Survey, Clarence King, well remarked that the constitutional right of the Federal Government "to regulate internal commerce could hardly fail to carry with it the correlative right to gain a knowledge of those commodities and products which are the very material and basis of commerce." In its relation to the mining industry, therefore, I discover no limitation set upon the work of our Survey by reason of its federal character; but rather see in this one of its greatest sources of strength and efficiency.

The second part of the name is "Geological." In the wording of the law creating the Survey, "mineral resources" and "geological structure" are linked together in a closeness of union that is well justified by the results of investigations showing the absolute dependence of the one upon the other in so many mining districts. There is, then, a fitness in the use of this adjective "geological" in the title of the organization. It expresses a recognition of the real basis of the mining industry, and upon this foundation the Survey has built well.

Between the lines of every appropriation bill for work under the auspices of our Survey we may read the words 'practical' and 'utilitarian'; yet even this evident purpose of the appropriation is not to be considered as a limitation upon the nature of the work. The very name of the organization to which these funds are entrusted speaks for its scientific character and in science progress is not attained by the separation of the practical from the theoretical, but by their union and co-ordination. The fruitage of theory is practice and we cannot gather the harvest without carefully tending the tree of knowledge. It is most important not to limit our concept of the useful as did the Englishman, who is quoted by Huxley as understanding utility to mean "that by which we get pudding or praise, or both." Better to count every investigation useful which our faith tells us may some time win pudding and praise for the other fellow. On this account you practical men must not underrate the contribution of the worker in pure science, but rather realize that his work is fundamental. For these reasons, again, we count it not a limitation, but the greatest advantage that this Federal organization approaches your important industry from the scientific side.

In the third place, I can discover no embarrassing property line in the word "Survey." To most of us, does not the term carry with it the flavor of the West, and the inspiration of discovery and exploration? It expresses the idea of getting at the truth at first hand, while such a word as 'bureau' serves only to emphasize the administrative and clerical side. "Survey," then, stands for work in the field, the winning of truth, not from books but from rocks, not in the office but in the stope; and, as you men well know, it is upon thorough field investigation alone that you can rely. On this account, I rejoice that 28 years ago Congress, in its

*An address delivered before the American Mining Congress, at Joplin, on November 11.

wisdom, retained the use of this one word which links the present organization with its predecessors whose records in the winning of the West are a valued heritage.

Our title to the claim is well established, for our patent rests upon no nominal compliance with the requirements as to assessment work. The field in which you are interested is a broad one and you are justified in the statement that too little attention has been given to your industry by the Federal Government. Yet, thus far all the development work is to be credited to the United States Geological Survey, and many witnesses could be cited to prove the value of its output. The subject of mining geology was put foremost in the plan of the organization of the Survey and the impetus then given to the investigation of ore deposits continues to the present day. Dr. Raymond, the Secretary of the American Institute of Mining Engineers, has said that the leadership which American observers have taken in the science of ore deposits must be attributed not only to the rich field here afforded and its active development by mining, as well as to the liberal expenditures made by State and Federal governments for its study, but also to what is most important, namely, the presence of men competent to take advantage of these favorable conditions and "the wise provision made for such investigations by the first Director of the United States Geological Survey."

May I now speak of the possibilities of the Geological Survey? At other sessions of this Congress representatives of the Survey have explained to you the contributions it has made to your industry, and already I have incidentally touched upon the same subject. I propose, therefore, to confine myself to only a brief mention of the present work, and that merely as a basis for the statements of further possibilities of development.

Our topographic maps, in accuracy of detail and in excellence of mechanical execution, are of the highest grade. Every three days our office is publishing one of these maps based on actual survey, and much oftener is printing a new edition of some earlier sheet; yet we appreciate the fact that one class of men, to whom many of these maps would be of greatest assistance—the prospector—rarely knows that such a map is extant. Of even greater value is this map to the mine operator, who follows the prospector and plans the development of the property, and therefore should have before him all the data bearing upon the important questions of water supply and transportation. The endeavor of the Survey must be, not alone to make better topographic maps and more of them, but to get these maps into the hands of the people for whom they are made.

Much the same statement can be presented regarding our geological maps. Every month, on the average, a folio is issued which presents graphically all that is known regarding the geological structure and the distribution of the mineral wealth within a district embracing an area of from 200 to 1,000 square miles. A large proportion of these geological folios cover mining districts and are especially addressed to the mining fraternity. However, it again appears that the Survey's geologic folios do not reach all who might profit by the facts they set forth. The price asked for these publications is only nominal, the real difficulty is that of advertising our output. Recognizing the possibility of increasing our usefulness by wider publicity, I pledge myself to a special effort to reach the mining man, however distant from the great centres he may be.

Perhaps the Survey has nowhere better improved its opportunity to aid the mining industry than in Alaska. The literature on Alaska of value to the mining man is almost wholly composed of Survey publications; yet the exploration work represented by these reports and maps

has involved an expenditure of less than \$500,000, or only one-half of 1% of the gold output for the same period. Few taxes are so light as this, especially when we consider also that the work done by the Government geologist covers also the coal, copper, and other resources of that region, and that the benefits will continue through a term of years.

Reference has already been made to the importance of reliable statistics regarding the mining industry. At the time of the organization of the Geological Survey the country possessed no adequate knowledge of the status of mining, although this is one of the great primary industries based upon natural resources. Advantage was at once taken of the new organization, and the systematic statistical study of the mining industry under the 10th Census was entrusted to the Director—Clarence King. I refer to this because in the successful issue of the work under these auspices can be discerned the correct policy for this important work. King's plan of utilizing for statistical work the services of those most closely in touch with the mines deserves continuance, and in view of our recent progress along this same line I assure you that there is within our reach the possibility of much greater usefulness to your industry.

The scope of the Survey's statistical work, like that of all other of its investigations, has been limited by the appropriation available; increase that, and more and more can be done in the matter of keeping the country informed as to the phenomenal development in the technology of the mining industry as well as the no less marked increase in production. I need only to suggest to you the inherent connection existing between an adequate and exact knowledge of any industry and its future development. It is only by observing, recording, and publishing each advance in the utilization of these mineral resources that true progress will be insured; and here, again, it is to be noted that to secure the best results there must be the closest relations between geologist and statistician; best of all is it when the investigator can justly claim both titles. Without full information regarding the latest development in mining, metallurgical, or milling practice, the geologist-explorer cannot intelligently conduct the work entrusted to him, and on the other hand, without a quantitative knowledge of the varied contents of nature's mineral storehouse, the student of statistics cannot appreciate the bearing of the data he collects.

The record of the Geological Survey in mining geology warrants the hope of greater development in the field it has occupied during these years. Let me again cite the disinterested testimony of those unconnected with the organization. A leading mining journal has within a few years stated that in no other country "has economic geology been applied to the development of industry with such beneficent results as in the United States, and no (other) geological survey has contributed so much to the practical application of the science of geology to mining operations."

Not only in this country, but abroad, the United States Geological Survey is regarded as in reality performing the work of a mining bureau by reason of its activity in fostering the development of the mineral resources of the country. Last year, the *Canadian Mining Review*, in an editorial, pointed to the successful contributions to the mining industry made by our Federal Survey as the strongest argument against the continuance of the independent existence in Canada of a Geological Survey and a Mines Branch, with the resultant duplication of endeavor involving greater expense and less efficiency. The effort should be, not only to expand the work, but also to seek a logical correlation of all the various

branches of research that will benefit your industry, for logical correlation means economy.

I must not leave the subject of mining geology without a reference to one of the greater possibilities for increasing the efficiency of the Geological Survey. Legislative authority should be secured for a certain amount of investigation in foreign countries of ore deposits, together with mining conditions and methods. Several of the Survey's mining geologists, from time to time, while on leave of absence, have been engaged by foreign corporations to report upon properties in South Africa, Australia, and South America, and the extent to which the Survey has benefited by reason of their foreign service is keenly appreciated.

The statement of official publications planned by the first Director of the Geological Survey indicates the value which he attached to investigations into the technology of the mineral industry, even to the matter of testing the relative cost and efficiency of different types of mining and milling machinery. Little, however, was done along these lines until, under Mr. Walcott, the Survey took up the fuel-testing work which has reached so successful a development under the recently organized Technologic Branch of the Survey. The chief of that branch has already addressed you on the need of conserving our mineral resources, and I need add little to his argument for increasing our work for the better utilization of fuels and the prevention of waste.

Again, I wish to call your attention to the complexity of the mineral industry of today. The inter-dependence of the one mineral product upon many others makes the miner of all men dependent upon many factors outside his own mine. Waste of our supply of wood, water, and mineral fuels will hasten the day when certain ore deposits can no longer be mined at a profit. Hence, we count upon you mine-owners for hearty support in the work that the Forrest Service and the Geological Survey are doing in the conservation of the natural resources of the nation.

At the El Paso session of this congress the Chief Geologist of the Survey enumerated certain apparent needs of the mining industry for meeting which insufficient provision had been made by the Federal Government. The arguments clearly set forth at that time I will not repeat, yet it is worthy of note that a full compliance with the demand for free assays and for free advice, both as regards mineral properties and mining technology, would be of the nature of an expansion of work already undertaken by the Survey.

One distinction, however, must be made between what may be asked and what can be granted by the Geological Survey. I refer to the legal restrictions by which "the Director and members of the Geological Survey shall have no personal or private interests in the lands or mineral wealth of the region under survey, and shall execute no surveys or examinations for private parties or corporations." This law may be thought to restrict our activity somewhat, yet it surely adds to the value of our results. Increased appropriations would enable us to meet these specific needs, although the assays and other examinations made by the Geological Survey should be only for new finds, or for new methods, and the results should be promptly published for the information of the public rather than of the individual. In a word, the work of the Survey geologist, engineer, statistician, or chemist is planned not to encroach upon that of the mining engineer or the assayer in private practice, but to be basal in character, and of a nature to assist these professional men as well as the prospector and the mine-owner. I am not unmindful of what your industry has suffered at the hands of the unscrupulous, who masquerade under

the title of expert, and against these the Federal survey is ready to protect both prospector and investor. More and more is our organization taking upon itself work of this kind, which is always delicate and often thankless.

It may be well to note that the Geological Survey is not charged with the enforcement of the law, but is rather a bureau of information; yet as such it is no less our duty to assist in law enforcement, especially in all that relates to the classification of the public lands. At the time of the inauguration of the work of the Geological Survey the classification intended by Congress was believed to be general in character, and such as would be expressed upon maps issued for the general information of the people. The present interpretation is that the classification should be more definite, and, therefore, during the past season the Survey has been actively engaged in the classification and valuation of the coal land of the public domain. Increased demands are also being made upon our mining geologists for assistance in the determination of the mineral or non-mineral character of land of which title from the Government is sought. In all this work the sole purpose of the Geological Survey is to determine the truth of the issue and thus to protect the interests of the public. Our purpose is to assist the legitimate miner by opposing his worst enemies, the land grabber and the unscrupulous promoter of wildcat schemes, and in this we know that we have the support of the men who really represent the mining industry.

Your president has outlined definite recommendations for the further extension of Federal work in aid of the industry you represent. With full faith in the trained men who constitute its working corps, I promise, in behalf of the Geological Survey, that our possibilities in your service will be limited only by the appropriations which your representatives in Congress may entrust to us. In the Survey's effort to serve the mining industry, then, I recognize no limitation beyond those set down by Congressional enactment, and I will gladly join with you in the effort to seek to make such enactment fit your real needs. Under what Federal auspices the mining work should be conducted is not so important a consideration as that the work should be done and done well.

In conclusion, the lines along which I propose to have the United States Geological Survey advance to a position of greater usefulness to the mining industry are these:

First—The fuller recognition of its duty in the classification of the mineral lands of the public domain.

Second—The rapid extension of systematic field study of all mineral deposits, so that geological exploration may keep in advance of economic development.

Third—The further development of the Survey as a source of authoritative and disinterested information, for the benefit of the prospector or the land owner.

Fourth—The broadening and improvement of the methods of collecting mineral statistics, with the purpose of securing more accurate returns and of expediting their compilation and publication.

Fifth—The investigation of processes relating to the mining and later treatment of fuels, ores, and other mineral products, in so far as such investigation may be fundamental to the best utilization of the nation's mineral wealth.

Sixth—The preparation of reports that will better meet the needs of the mining industry, and the distribution of publications more promptly and effectually.

These are not radical departures, for the Survey is at present making progress along each of these lines of public service, and we mean to continue that progress; yet the rate of our advance, and that is what you are most interested in, will be largely accelerated by the more generous support which you are able to ask for us.

History of Cyanidation.

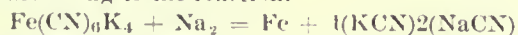
By PHILIP ARGALL.

*About two hundred years ago the chance manipulation of impure chemicals by Diesbach, a Berlin color manufacturer, resulted in the formation of ferric ferrocyanide or prussian blue—the first cyanogen compound known. This chance discovery of a new compound and a new color, while of the first importance to Diesbach, was none the less portentous of the yet undiscovered cyanide compounds which have since revolutionized more than one industry, and added mightily to the gold production of the world.

The simple production of prussian blue was distinctly epoch-making, and rightly takes rank amongst the greatest of chemical discoveries, if measured only by the present usefulness of the cyanogen compounds in the metallurgy of gold. At the time prussian blue was discovered in 1704 indigo was the only blue coloring matter known, and so we find Diesbach and his partner, Dippel, an alchemist, were quite early engaged in the manufacture of this new and beautiful cyanogen compound. In 1710 Dippel presented a paper to the Academy of Berlin calling attention to the new compound, without, however, disclosing the method of its preparation. Fourteen years later Woodward¹, an English chemist and Fellow of the Royal Society, not only succeeded in making prussian blue, but also made public the method of its preparation, and it is interesting to note that this method of Woodward's is practically the process by which prussian blue is prepared today. Macquer, in 1752, observed that when prussian blue is boiled with caustic potash, oxide of iron remains, whilst a peculiar salt enters into solution which was named phlogisticated alkali, or yellow prussiate of potash². This body was shown to contain iron and prussic acid by Berthollet in 1787.

The actual composition of prussian blue was not known until 1782, when Scheele, 78 years after its discovery, obtained an acid from it which, in consequence he named "prussic acid," but even then the composition of the acid was not known. Prussic acid, hydrocyanic acid, or nitride of formic acid (CNH) occurs in certain plants, as for example, in laurel leaves, peach leaves, and in kernels of several kinds of stone fruit. The acid, however, was first obtained in the pure state by Gay Lussac³ in 1811, while four years later the same chemist discovered the radical cyanogen and showed that it was capable of existing in the free state. Hydrocyanic acid is said to have been known to the Egyptian priests and used by them to kill traitors.

Cyanide of potassium was first made by the simple fusion of yellow prussiate of potash and ferrocyanide of potassium in iron crucibles; when this operation is properly conducted the result is a mixture of carbide of iron and cyanide of potassium, the former adhering to the sides of the crucible, the latter in the midst of the mass. With a view to remedying certain objections to the foregoing process, Liebig proposed the ignition of dry ferrocyanide in the presence of dry potassium carbonate. At present much of the cyanide of potassium used in cyanidation of ores is produced by the Erlenmeyer process, which is based upon the action of sodium on ferrocyanide of potassium according to the reaction:



The resulting product is next treated with water, the solution evaporated, and the salt sold as 98% potassium cyanide, but it is really a mixture of 1 molecule of potassium cyanide and 2 molecules of sodium cyanide.

With the introduction of the aniline colors, prussian blue found but a limited use in the arts, while cyanide, formerly of limited application in medicine, photography, electroplating, and as a laboratory reagent, has, since the cyanide process was established on a full scale, been used in greater quantities than any of the cyanide compounds, even now over one-half the potassium ferrocyanide produced is used in the manufacture of potassium cyanide.

Cyanogen, really a nitride of carbon, greatly resembles the halogens, and in many reactions behaves like a simple substance, or in other words, plays the part of an element. The radical cyanogen combines like chlorine with hydrogen and the metals; its compounds are comparable with those of chlorine, to which they have the strongest resemblances. Therefore as the halogens, chlorine, bromine, and iodine all dissolve gold, as do also some of their compounds, it was but a natural inference that cyanide of potassium would dissolve gold, as pointed out by Hagen in 1806. Of the various cyanogen compounds, I shall now confine myself to potassium cyanide (KCN) and endeavor to show in a casual way the development of this salt as a gold solvent on a practical scale.

It is reported that Dr. Wright, of Birmingham, England, used gold cyanide solutions for electroplating as early as 1840, in consequence of his investigations following the publication of Scheele's report on the solubility of gold cyanide in a solution of potassium cyanide. The brothers J. R. and H. Elkington made the first practical application of potassic cyanide as a gold solvent, and patented it in 1840, in connection with the electro-deposition of gold from cyanide solutions, or at least the first application I have been able to find, though it does look somewhat closely related to Dr. Wright's process above mentioned.

The Elkington solution was made by dissolving salts of gold in potassium cyanide; in their arrangement the articles to be gilded form a cathode, a plate of gold the anode, both immersed in the cyanide bath. The gold as deposited on the article to be gilded was dissolved from the gold anode plate, thus keeping the auro-potassic cyanide bath of about the same strength; here we see that a solution of potassium cyanide, plus electricity, was at this early date (1840) a known and recognized commercial gold solvent, and with but slight modifications it is so used in electroplating today.

In 1843 the Russian Prince Bagration⁴, while investigating the Elkingtons' process, discovered that cyanide can dissolve gold without the aid of electricity. It is said that in the course of his researches he poured some cyanide solution into a gilded vessel and on emptying the vessel sometime later found the gold plating had been removed from the sides and bottom. After a thorough examination Bagration reached the following conclusion, which not only stands good today but also quite fairly sums up our general knowledge of the action of potassium cyanide on gold:

First, that cyanide of potassium will dissolve metallic gold; second, that if the gold is very fine it will pass rapidly into solution; third, that the electric current did not in the least help the solvent action of the solution of the gold; fourth, that heat greatly assisted the solution of the gold; that gold in cyanide solution can be precipitated on metallic surfaces without the aid of electricity; and lastly, that the air has a very marked action in quickening the solution of gold in cyanide solutions.

We next come to Elsner⁵, who in 1844 stated as the result of his researches:

"The dissolution of the metals (gold and silver) is, however, the consequence of the action of oxygen, which,

*A paper read before the Colorado Scientific Society on November 2, 1907.

¹Phil. Trans., 1724.

²Noscoe and Schorlemmer (Chem., Vol. 2, p. 1,020, 1895).

³Annales de Chimie, 77 (128), 95 (136), 1811.

⁴Bull. de l'Acad. des Scie., St. Petersburg, T. 11., p. 136, 1843.

⁵Erdm. Jou. Prak. Chem., Vol. 37, p. 441, 1846.

absorbed from the air, decomposes part of the cyanide."

This statement, showing oxygen to be necessary, is probably the most important fact connected with the use of cyanide as a gold solvent, and is rightly claimed as the second step in the dissolution of gold by means of potassic cyanide. The recent development of the cyanide process is the direct outcome of this theory. It should be noticed, however, that Elsner's work at this time was merely qualitative: that he did not even suggest an equation to show the possible reactions involved in the solution of the gold, and that the much quoted Elsner equation was only given to the world during an inaugural dissertation at Göttingen 22 years later (1866). In 1857 Faraday pointed out⁶ that gold leaf resting on the surface of a cyanide solution dissolves a hundred times quicker than gold leaf that is only immersed therein. Faraday believed that air voltaic currents are formed in these cases, and that the gold is dissolved almost entirely under their influences. This appears doubtful.

Up to this time strong solutions of cyanide were used. In 1866, however, Dr. Henry Wurtz⁷, in the *American Journal of Science*, made the important announcement that weak solution of cyanide would dissolve gold. In the following year J. H. Rae⁸ of Syracuse, N. Y., patented an important method for treating gold and silver ores; by subjecting them to a cyanide solution and an electric current, following by precipitation on copper; also by electricity. Rae then, as far as our knowledge goes, made the first application of cyanide to ore treatment, and used agitation to hasten the action. It is very doubtful, however, if this patent was even put into even experimental use on a working scale. I pass over the inventions of Thomas C. Clark of Oakland, California⁹, Hiram W. Faucett of St. Louis¹⁰, and John F. Saunders of Utah¹¹ as immaterial, though cyanides were used by them or claimed to be used under the patents applied for, yet their processes do not bear the stamp of practicability, and have long since been forgotten. They do, however, show that the minds of American inventors were running towards cyanide—scenting, as it were, the coming battle from afar.

The next inventor to hold the field is Simpson of Newark, New Jersey¹², who patented, in 1885, a process for separating gold and silver from their ores by means of subjecting the ore to the action of a solution of potassium cyanide and carbonate of ammonia, precipitating on zinc, which he does not, even at that date, claim as new. Simpson's great improvements are, therefore, the introduction of an alkali to correct acidity, dissolving the precious metals without electricity; and also precipitating without an electric current. Simpson's patent covered the ground very fairly, but it was not pushed; was, in fact, one of those great inventions that lie dormant for years, as if they had arrived before their time. It may be, however, that suitable ores were not available for Simpson, for we hardly believe that had the Mercur (Utah) ores, or those of Johannesburg been available, Simpson's process would, notwithstanding the then very high price of cyanide, not have been developed into a commercial success.

These American patents of Rae and Simpson attracted notice abroad, for we find W. A. Dixon, in a lecture before the Royal Society of New South Wales, in 1887, going somewhat out of his way to decry an American gold extraction process in which potassium cyanide was the solvent. His principal objections were the cost of the salt used, its instability and poisonous nature, quite per-

tinent, and not unreasonable criticism at that early date; indeed, within the present year I have had almost precisely similar criticism leveled at a slight departure from the beaten path of cyaniding that I had intended taking, in which it was proposed that the ore be crushed, concentrated and agitated in dilute cyanide solution. W. Skey, the distinguished New Zealand chemist, called attention in 1875 to the fact that both gold and silver were soluble in cyanide solutions, and that considerable losses of precious metals occurred in amalgamation mills from the too free use of cyanide.¹³

From 1886 onward many chemists were at work on various cyanide schemes, none of which cut much figure until MacArthur and Forrest, of Glasgow,[†] secured their patents in 1887, and formed the basis of a successful working process, introduced by the Cassell Gold Extraction Co., but for some reason it was not applied on a working scale until 1889, when a plant was erected at the New Zealand Crown mines, in the Karangahake district. Here agitation formed a prominent feature of the process, but later was replaced by the percolation methods. The ores of Karangahake are very difficult to treat by the old methods; battery and amalgamated copper plate gave only some 15 to 20% extraction; dry crushing and pan amalgamation gave about 60%, while cyanide yielded 90% of the assay value of the ore. The following year, 1890, the tailing from the Robinson mine, at Johannesburg, South Africa, was successfully cyanided, and from that date it may be said the process sprang into general use all over the world.

I have traced quite briefly the various stages leading up to the introduction of the cyanide process on a commercial scale, and we might now ask who invented the process? Like most other achievements, no one can lay full claim to its entire invention; in fact, it was not invented, but grew in the minds of men, until the fullness of time and a suitable ore had arrived, and then success could not be prevented. Let us glance briefly at the MacArthur-Forrest patents, and their reception by the courts, to see whom the law decided to be the inventor of the process:

The first patent, No. 14,174, the MacArthur-Forrest,¹⁴ was taken out in England, October 19, 1887, the specific claim being:

"1. The process of obtaining gold and silver from ores and other compounds, consisting in dissolving them out by treating the powdered ore or compound with a solution containing cyanogen, or cyanide, or cyanogen-yielding substance, substantially as heretofore described.

"2. The process of obtaining gold and silver from ores and other compounds, consisting in dissolving them out by treating the powdered ore or compound with a dilute solution containing a quantity of cyanogen or a cyanide or cyanogen-yielding substance, the cyanogen of which is proportioned to the gold or silver, or gold and silver, substantially as hereinbefore described."

In describing the method of separating the precious metals from solution, the patent states the solution is treated "in any suitable known way, as for example with zinc." Thus showing that in August, 1888, zinc precipitation was, in the opinion of the patentees, a suitable known method, and hence not claimed in the patent specification.

Coming now to the American patents of MacArthur and Forrest: The main patent is dated May 14, 1889, No. 403,202, the specific claim being¹⁵: "Subjecting the powdered ore to the action of a cyanide solution contain-

⁶Royal Inst. Proc., Vol. 2, p. 308, 1857.

⁷*Am. Jour. Sci.*, Vol. 41, p. 222, 1866.

⁸U. S. Patent, No. 61,866, Feb. 5, 1867.

⁹U. S. Patent, No. 229,586, July 6, 1880.

¹⁰U. S. Patent, No. 236,424, Jan. 11, 1881.

¹¹U. S. Patent, No. 244,080, July 12, 1881.

¹²U. S. Patent, No. 323,222, July 28, 1885.

¹³Trans. & Proc., New Zealand Inst., 1875.

[†]*Jour. Chem. Soc.*, Vol. 30, p. 588, 1876.

¹⁴British Patent, No. 14,174, app. filed Oct. 19, 1887.

¹⁵U. S. Patent, No. 403,202, May 14, 1889.

ing cyanogen in the proportion not exceeding eight parts of cyanogen in one thousand parts of water." In explaining their process the patentees state the invention consists in subjecting the auriferous ores to the action of a solution containing a small quantity of cyanide—without any other chemically active agent.

The next American patent¹⁶ is 418,138, issued December 24, 1889. It relates to the filiform zinc sponge for precipitating the gold from cyanide solutions, now almost universally used for that purpose, though just as satisfactory results can often be obtained by the use of zinc powder. This method, however, was the subject of a British patent issued to Astley P. Price¹⁷ in 1884, which clearly anticipated the use of zinc as provided for in the MacArthur-Forrest process; nevertheless, the filiform zinc is in my opinion preferable, and it was both a new and novel form of precipitation, and as such worthy of an enforceable patent. These various MacArthur-Forrest patents were taken out in the principal mining countries throughout the world.

The German patent was cancelled February 2, 1895, by decree of the Imperial German Court, based chiefly on priority of invention by Rae and Simpson in America.¹⁸

As to the exclusive use of cyanide by MacArthur against cyanide and carbonate of ammonia by Simpson, the Court said:

"If the additions used by Simpson are, however, substantially immaterial for the purpose aimed at, then ammonia is certainly a simplification of the process, but not an alteration affecting the essence of the same. Furthermore, too, the monetary value of the addition is such a trifling one that the saying cannot be considered as industrial advance."

The second trial of the patent was conducted in England, in November, 1894, before Mr. Justice Romer, a gentleman as widely known by his scientific attainments as by his legal learning. His decision goes over the ground of the Rae and Simpson patents, and the chemical knowledge universally known that cyanide was a solvent for gold, and states:¹⁹

"But in addition to the above, I think there is another ground on which this patent is bad. Even if the invention was one which could form the good subject of the patent, I think it was anticipated by Rae's and Simpson's specifications. Test it in this way: If the patent were held valid, would not Rae's and Simpson's processes, if now used according to the specifications published, be liable to be stopped as infringements? I think they certainly would. What chance of escape would a person have who took Rae's, for instance, and used the cyanide of potassium specially mentioned by Rae? It would be used against that person with crushing effect, that he was using the cyanide of potassium for the very purpose pointed out in the plaintiff's patent, namely, to dissolve the gold in the crushed ore, and not the less because he tried to assist the process by the aid of electricity, which might or might not be of any real assistance, and certainly not the less because he used the electricity for another and different purpose. So, also, a person using Simpson's process would be liable to be stopped. For it would be proved against him that he was using the cyanide of potassium for the very purpose and in the very way pointed out in the plaintiff's specification, and that the addition of carbonate of ammonia made no material difference. To hold that Simpson's was not an anticipation would lead to a strange result. A person using cyanide of potassium

alone would be an infringer, but, if he chose to add a slight amount of carbonate of ammonia (which is cheap and practically innocuous), he could not be restrained. Now, as the specifications of Rae and Simpson were published here before the date of the plaintiff's patent, all persons in this country are at liberty to use the processes there set forth, and that right is incompatible with those persons being liable, if they do use such process, to an injunction at the suit of the plaintiffs. For these reasons the action must be dismissed."

The decision of Justice Romer was reversed on appeal, or partly so, and in amending the patent to conform to the American claims, it became binding in England.

The Transvaal patent was the most valuable of the MacArthur-Forrest Co., and on it the most stubborn fight was made. Here again the selective action of weak solutions constituted the principal claim of the defendant company. The patent appeared to be similar to the English one, the first claim for the MacArthur-Forrest process being a discovery that a solution containing cyanogen would dissolve gold. The second, being less general, stated that a dilute solution of cyanide proportioned to the quantity of gold had to be employed.

Judgment of the full court follows:

"The plaintiff maintains that this so-called MacArthur-Forrest process is not a new discovery, and has been anticipated. With regard to the first claim, that a cyanide solution dissolves out gold from ore, we may take it as clearly established by the evidence that at the time when the patent was applied for and granted it was a well known fact that gold could be obtained from ore by a solution of potassic cyanide. The first claim, therefore, in favor of the MacArthur-Forrest patent, No. 47, cannot be sustained."²⁰

In this case counsel argued strongly that MacArthur and Forrest showed that weak solution of cyanide dissolved gold, and had, as they claimed, a selective action for gold over the base metals in the ore. On this point the Court said:

"Chemical affinity is, however, a law of chemistry, a law of nature, which, as Mr. Wessels argued, can no more be patented than the law of gravitation."

The mere dilution of a chemical was held to be no invention. The patent was cancelled. Adverse decisions were also given in New Zealand and several of the Australian colonies.

Returning to the American patent: Pure cyanide solutions, without the aid of any other active chemical, will not dissolve gold. Oxygen is necessary, and this point alone would probably have invalidated the American patent, as the patentees limited themselves to cyanide alone, excluding the very active agent oxygen.²¹

(To be Continued.)

RAILWAY CONSTRUCTION IN PERU.—London financial journals report that a settlement has been reached in the long outstanding dispute between the Government of Peru and the Peruvian Corporation, the latter being the company that operates almost the entire railway system of the country. New contracts are to be made with respect to the works at the port of Mollendo in the south, and in regard to Chira canal in the north. The corporation is to complete the railway extensions from Oroya to Huancayo, from Sicuani to Cuzco, and from Yonan to Chilite, such extensions to be ready for provisional traffic by September 24, 1908, and to be definitely completed nine months later. The lease to the corporation is to be extended 17 years, during which period the Government is to receive 50% of the net profits of the railways.

¹⁶U. S. Patent, No. 418,138, Dec. 24, 1889.

¹⁷British Patent, No. 5,125, 1884.

¹⁸*Australian Mining Standard*, Jan. 30, p. 789, 1896.

¹⁹Law Report, *London Times*, Nov. 9, 1894.

²⁰*Australian Mining Standard*, pp. 1,610-13, Jan. 21, 1897.

²¹U. S. Patent, No. 418,137, Dec. 21, 1889.

Sliming Ore for Cyanidation.

Written for the MINING AND SCIENTIFIC PRESS
By MARK R. LAMB.

The numerous recent attempts to treat any and all ores as "all slime" have resulted in much valuable information. It is not so certain from the present outlook that the sliming of all the ore is generally advisable or even possible. It will be remembered that Mr. E. M. Hamilton brought this out plainly in his report on El Oro ores. However, the recent great improvement in slime-filtration seems to be responsible for the prevailing opinion that it is possible, even easier, to treat and wash sand by agitation and vacuum-filtration than by leaching. As is usually the case in metallurgy, there is a happy medium method and the recent partial failures seem to have pointed this out. It is necessary to premise such a note as this with the clear statement that no two ores are mechanically alike—that in all cases individual experiments must be made. With this understood, it is safe to say that sand cannot always be filtered successfully on vacuum-filters.

One plant was designed and erected along these lines after careful and repeated tests (not mechanical) and it now transpires that although extraction from the finely ground ore is rapid and all that can be desired, it is practically impossible to agitate with geared stirrers if the pulp is once allowed to settle. Further, it is practically impossible to keep the pulp in suspension during filtration. The ore is largely hematite and while a part grinds almost to a solution, being very difficult to filter, another part remains as a very heavy sand, settling like shot and packing like cement. This problem is to be solved by air-lift agitation and subsequent classification. The separated sand will be washed in a comparatively small leaching plant. This classification will be simple and allows of a leaching rate of about three inches per hour.

Set off against this plant and its results, the recent experiments made on a large scale by a company in Mexico which expects to re-treat sand residue. The sand, already clean of slime, was re-ground to practically 200 mesh and has been found to leach nicely even at this fineness. Moreover, the pulp, containing little slime even after the re-grinding, stays in suspension in the filter-box without any special means of agitation and forms a 2-in. cake on a Butters filter-leaf in 20 minutes. At this rate the capacity of the filter is three times what it is under ordinary conditions and it may figure out cheaper to filter this 'all-sand' pulp; or it may be cheaper to give the final water-wash (after air-agitation with wash solutions) in sand-vats.

Another plant has an exceedingly fine slime, which requires a low vacuum at the beginning of filtration to prevent drawing dirty solutions through the filters, and what is worse, drawing slime into the interior of the filter-leaves. This trouble was experienced at first, but the simple expedient of starting gently removed the source of trouble. This filter was too small for the work, being supplied with pulp containing a large proportion of sand. After this coarse sand was removed and it was not necessary to hurry filtration, the solution passed clear enough to be sent to the precipitation-boxes without previous clarification.

Another plant of stamps, with sand and slime vats, expected to place two tube-mills for re-grinding and therefore obtained a filter large enough to wash the (supposed) increased tonnage of slime. This increase did not come with fine grinding, although the filter is now supplied with its full capacity of slime by an increase in the number of stamps. The slime, as it comes from the mill, will settle only to about 1.1 sp.gr. (7 to 1), showing its ex-

tremely fine state, yet the effluent solution from the filter is entirely clear—much better than the decanted solutions, and even these latter are sent directly to the zinc-dust precipitation-vats. The classification is made with cones and considerable slime goes to the leaching-vats and the slime contains little or no sand. For this reason the slime forms a cake uniform in thickness from the top of the filter-leaf to the bottom, and, in spite of the fact that sand is absent, the slime washes evenly and quickly. This is a slime that will not decant much below 78% moisture in 15 hr., which in the design of the plant meant either an excessively large slime-plant of vats for settling or a large loss of dissolved precious metal.

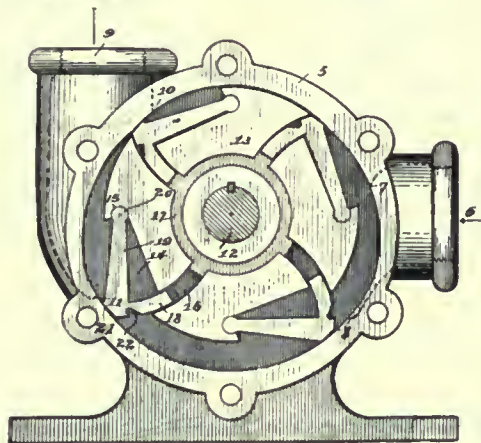
It seems to be proved that no one can tell by looking at an ore or slime, or by testing it merely by concentration and cyaniding, how it will agitate and filter, and that tests to determine its probable mechanical behavior may entirely change proposed practice. Air-lift agitation has solved the problem of cheap and effective agitation of either sand or slime, but from the fact that fine grinding will increase extraction it does not follow that the entire mill product should be treated as slime. When it can be so treated such a plant is, of course, ideally small, self-contained, inexpensive, and easily operated.

Mining in Quebec.

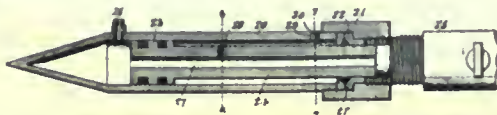
The annual report of J. Obalski, Superintendent of Mines of Quebec Province, for 1906, has just been issued, showing a total output of the value of \$5,019,932 as compared with \$3,755,000 in 1905. Though the figures indicate increased mining activity, neither gold nor silver were produced during the year in appreciable quantities, and the yield of copper ore was only 32,527 tons, valued at \$176,681. Bog iron ore was produced to the amount of 18,321 tons, valued at \$61,175, which was treated at the blast-furnaces at Radnor and Drummondville, the output being 7,851 tons of pig iron, worth \$177,643. The production of chrome iron ore and concentrate was 8,961 tons, worth \$91,834. The largest item was asbestos, the output of which was 61,675 tons, valued at \$2,143,653, as against 48,960 tons, valued at \$1,475,450, in 1905. Asbestos to the amount of 21,119 tons, worth \$18,875, was also produced. The year was also a prosperous one for the mica industry, the yield being 530,086 lb., valued at \$168,887. The output of portland cement from the two companies engaged in its manufacture was 405,103 tons, of the value of \$625,570. The report includes an account of an exploration trip undertaken by Mr. Obalski through the region east of Lake Temiskaming and the Ontario boundary and to the north of Pontiac county, where the same Huronian formation occurs that is found in the Cobalt area. A summary of the results of geological investigation as far as it has been prosecuted in that region is given, showing that it presents a great variety as regards soils and timber and that a considerable breadth of it is traversed by the Huronian belt from Chibogomo to Cobalt. But the Laurentian formation has been found to extend farther north than was hitherto supposed and only islets of the Huronian have been discovered in the surveyed townships east of Lake Temiskaming. While much prospecting has been done, only one company has put up a plant and done development work on indications of chalcopryite in Fabre township. In other parts of the surveyed area galena, chalcopryite, pyrite containing some gold, magnetic iron, and cobalt bloom have been found, but no regular mining work has been done. Gold-bearing quartz has been found at Opatatica and Abitibi lakes; chalcopryite near Fish lake on the Ontario boundary, on the Bell river and on the Harrieanaw river, north of the transcontinental railway.

MINING AND METALLURGICAL PATENTS.

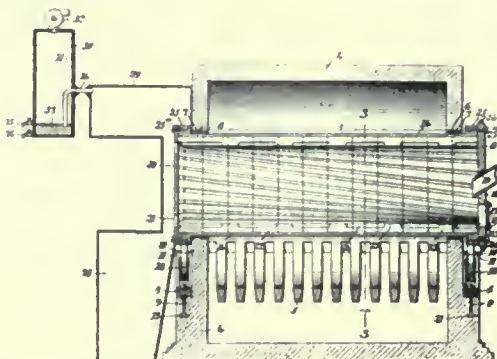
Specially Reported for the MINING AND SCIENTIFIC PRESS.

ROTARY PUMP.—No. 869,050; Robert M. Blackmer, Conway, Michigan.

In a rotary pump, a pump casing formed with parallel side walls and a cylindrical wall having arcs of different degrees of curvature, said casing having an inlet-port located some distance beyond one end of the arc of smallest radius, and a discharge-port on the opposite side of the cylindrical wall therefrom the orifice of which overlaps the other end of the arc of smallest radius, in combination with a rotary bucket-carrier mounted in said casing concentric with the arc of smallest radius, and a series of buckets mounted in pockets formed in the periphery of said bucket-carrier and having radially swinging blades adapted to engage the inner surface of the cylindrical wall of the casing under centrifugal action, substantially as described.

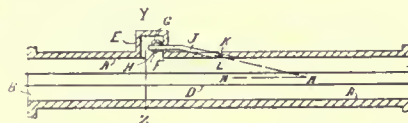
ROCK-DRILL-FEED MECHANISM.—No. 869,278; Thomas Turner, Ottumwa, Iowa.

In feed mechanism of the class described, the combination with a motor, of means for feeding the same to its work, said means comprising a cylinder and a piston operating therein, means for conducting and admitting fluid under pressure to the cylinder on one side of the piston, and means, located within the cylinder, for varying the effective pressure area of the piston acted on by such motive fluid.

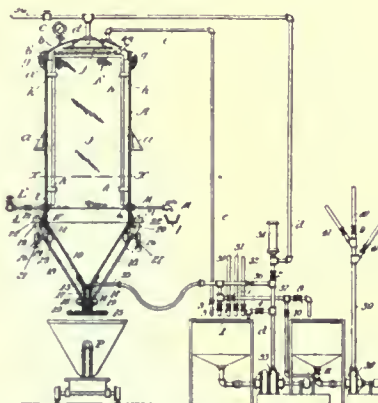
ORE-ROASTER.—No. 869,360; Allen J. Garver, Clarkston, Washington.

The combination of a cylinder, means for rotating the same, a cylinder head closing one end of said cylinder, and provided with apertures and with bevel edges bounding said apertures, means for heating cylinder, and an ore-pan disposed adjacent to the path of travel of said apertures. The combination of a revoluble cylinder, a cylinder head closing one end thereof, and provided with apertures and with bevel edges bounding said apertures, a dust-chamber partially inclosing said cylinder head and said cylinder,

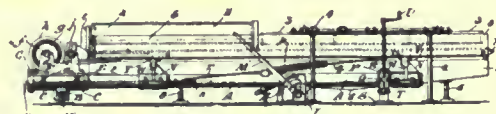
means for supplying ore into said cylinder, and an oven for heating said cylinder.

VENTILATION OF TUNNELS.—No. 869,297; Samuel C. Davidson, Belfast, Ireland.

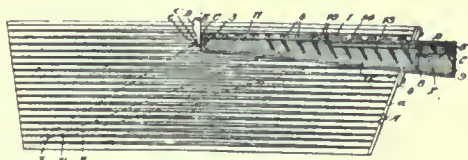
A tunnel having means for moving the column of air contained therein in a direction lengthwise of the tunnel, such means comprising air-forcing means discharging into such column at a point between the ends of the tunnel, said means delivering a blast of air of a cross-section so much smaller than that of said column, that the quantity of air delivered by said blast shall be insufficient to place the sides of said column under any considerable radial pressure, said blast being directed in such manner as to move the latter in the required direction.

FILTERING APPARATUS.—No. 869,732; David J. Kelly, Salt Lake City, Utah.

In an apparatus of the character described, the combination of a stationary tank, a pressure filter supported therein, a detachable bottom for said tank, and means for detachably locking the bottom to the tank during filtration, said locking means including projections on the tank, tightening rods carried by the bottom and adapted to engage said projections, a screw engaging said bottom, and a nut carried by the said rods and through which said screw operates.

ORE-CONCENTRATING TABLE.—No. 869,860; Frank E. Shepard, Denver, Colorado.

In combination in an ore-concentrator, a table, a frame member therefor, a transversely disposed base on which the said frame member is mounted to turn on its longitudinal axis, supports for the said base on which it is free to rock on a transverse axis, a vertically adjustable support for the said frame member by which it may be rocked with the base on the said transverse axis, and means for adjusting the said frame member upon the longitudinal axis.

FEED-BOX FOR ORE-CONCENTRATORS.—No. 869,293; William L. Card and Frank S. Card, Denver, Colorado.

A feed-box for sizing pulp preliminary to concentration by a concentrator, said box having a bottom inclined transversely downward toward the discharge side, and being provided with riffles.

Jeffrey Mining Machines.

The Jeffrey mining machines with flame-tight motors and starters shown in the accompanying illustrations were brought out almost simultaneously with the publication of the British Departmental Committee's report upon the use of electricity in mines. This report, which embodies rules for the use of electricity in mines, recommended the adoption of entirely enclosed motors and auxiliary devices, such as starters, terminals, etc., for all mines coming under general rule No. 8 of the Coal Mines Regulation Act of 1887.

Mining-machine motors of necessity have to be compact. It is therefore necessary that every advantage be taken of space, so that the motors will not heat excessively under their regular duty. In this country where our mines are free from gas, the open type of motor has found favor on account of its accessibility, and on account of the fact that the same motor-capacity can be put into smaller space in the open type than in the enclosed type. By careful designing, however, the Jeffrey Mfg. Co. has been able to introduce motors of the enclosed type which are of equal capacity to those of the open type formerly used, and the enclosed motors occupy practically no more space than those of the open type.

The Jeffrey 2I-A motor, which is typical of other mining-machine motors made by this company, is modern in every respect. The armature is drum-wound with machine-formed coils. The pole pieces are of laminated sheet-steel, and the windings of both the armature and field coils are insulated in the most approved manner for mining service. This service, by the way, is probably the most severe of any to which electric motors are subjected. The insulation has to withstand both oil and moisture, as well as heat and infinitely more dirt and less attention than in any other service known. The motors illustrated herewith are provided with self-oiling bearings, which are so arranged that the oil hermetically seals the motor so that any gas that may accumulate about the motor cannot possibly be ignited by sparking at the brushes or any interior trouble with the motor. Over the commutator of this motor is a plate-glass door, protected by a heavy malleable iron lid. Through the plate-glass door, the brushes may be observed without opening the motor to mine gases.

Commercial Paragraphs.

R. LINDENTHAL has resigned as manager for the Arthur Koppel Co. and will go to Berlin, Germany, as a representative for American manufacturers.

JOSHUA HENDY IRON WORKS, of San Francisco, reports the following recent sales of Anaconda timber-framing machines: Red Metal Mining Co., for use at its Tramway mine at Butte, Mont.; United Verde Copper Co., Jerome, Ariz.; Anaconda Copper Co., Butte.

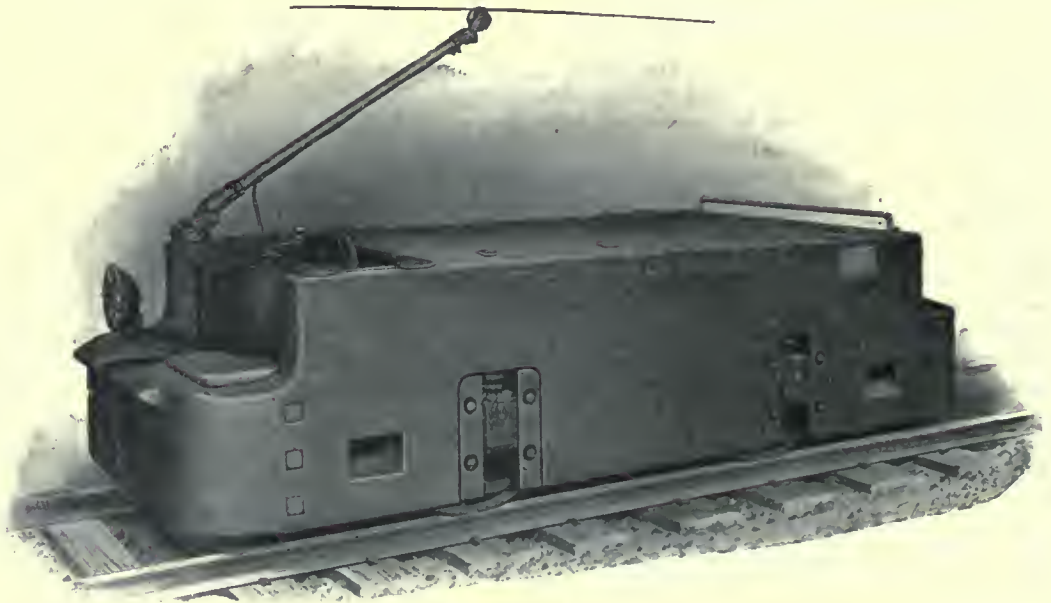
THE EMPIRE HAND PROSPECTING DRILL, manufactured by the New York Engineering Co., the well-known gold-dredge builders, of 2 Rector St., New York, has attracted the attention of gold-dredging experts from Alaska and Siberia to Tierra del Fuego; and recent sales are reported in the dredging districts of the Pacific Coast, Idaho, and South America.

They issue a very interesting booklet concerning this drill and its application to prospecting placer ground; this booklet will be mailed on application.

IN the 25 years since the MAYER SHOE Co. of Milwaukee began operations it has outgrown six factories. And in the last six months, during which the last factory annex in Milwaukee has been building, the volume of business has so greatly increased that even with this new annex the output lags far behind the demand. Including the new Seattle factory, which has just been completed, the total capacity of the Mayer Boot & Shoe Co. exceeds 9,000 pairs a day. This remarkable output, together with the inability of the Mayer Co. to build factories fast enough to keep pace with the demand, is most convincing evidence of the high quality of Mayer footwear.

Catalogues Received.

The DENVER ENGINEERING WORKS Co. has issued Bulletins No. 1,032, 1,033, 1,034. Bulletin No. 1,032 described



Jeffrey Motor for Mines.

their electric hoists, ranging in capacity from 675 to 20,000 lb. rope-pull. This company has ceased to rate its hoists by the horsepower, but instead gives the rope-pull at the drum as it is that which determines the strength of clutches, gears, and brakes. Besides, the weight of the load to be hoisted is the first thing decided upon in a hoisting problem; the speed is determined later, and then finally, the horsepower. Bulletin No. 1,033 describes their line of gear-wheels. This company owns the second largest gear-cutting machine in the United States and is prepared to cut special gearing of any form or tooth outline. They also carry a large line of gears, already cut. Bulletin No. 1,034 describes their rigid rolls for ore crushing. These rolls are cheaper than spring rolls and give little, if any, oversize. These rolls are quite strong and are not broken by ordinary pieces of iron going through them. Among some of the objects illustrated in this catalogue, which have passed through a set of 14 by 27-in. rigid rolls without hurting them is a $\frac{3}{4}$ by 1 $\frac{1}{2}$ -in. steel cap-screw.

Books Received.

'Tables of Quantities for Preliminary Estimates,' by E. F. Hough and P. D. Rice. Published by John Wiley & Sons. 16 mo, iii + 92 pp. Price \$1.25. This book contains tables in regard to cubic yard content of roadbeds, toe-slopes, and end-areas, the acreage of right of ways 100 ft. wide, and conversion tables for feet into miles, feet into chains, chains into feet, and fractions of an inch to equivalent decimals. For sale by the MINING AND SCIENTIFIC PRESS.

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TABLE OF CONTENTS

Editorial:	Page.
Notes.....	661
The Ore Market.....	662
Financial Correctives.....	662
Periodicity of Panics.....	663
By the Way.....	664
General Mining News.....	666
Special Correspondence.....	670
Chicago.....	
Salt Lake, Utah.....	
Denver, Colorado.....	
Wallace, Idaho.....	
Butte, Montana.....	
Chihuahua, Mexico.....	
Concentrates.....	675
Discussion:	
Cyanidation in Nevada.....	R. Stuart Browne 677
A Sampler.....	H. W. MacFarren 677
Professional Customs.....	
.....N., Foster Hewitt, James W. Neill 677	
Assessment Work.....	
.....Edward A. Belcher, Mark E. Davis 679	
Articles:	
The Prospector and His Friends.....	680
History of Cyanidation—II.....	Philip Argall 682
Radium in the Rocks of the Simplon.....	685
Topographical and Other Notes on the Choix-Guadalupe y Calvo Mining Districts.....	
.....A. W. Warwick 686	
Cyanidation With the Brown Vat.....	
.....Francisco Narvaez 689	
The Jamaica Earthquake.....	690
The Traylor Concentrating Table.....	692
Mining and Metallurgical Patents.....	691
Decisions Relating to Mining.....	681
Departments:	
Personal.....	665
Market Reports.....	665
Catalogues Received.....	692
Publications Received.....	692
Obituary.....	692

Editorial.

THE ARTICLE on a part of the State of Chihuahua, in Mexico, relates to an important mining region; and while Mr. A. W. Warwick's description of the topography will be found interesting, it is not too much to say that mining men will be especially grateful for the map prepared by him from his own surveys. The result is a valuable chart of a corner of the world concerning which accurate topographic information has been hitherto lacking.

WE PUBLISH a letter on the methods of cyanidation practised in Nevada, and we hope that it may elicit a useful discussion. At the present time the difficulty in marketing ore is directing attention to the need of local reduction works whereby the output of the mines may be converted into bullion with as little delay as possible. Bullion need not go to banks, it can be sent direct to the Mint, which, in turn, will give the coin now so much in demand.

HOARDING is a phase of unwillingness to lend, it is the concomitant of a financial crisis. It is estimated conservatively that \$75,000,000 has been withdrawn from circulation by American bank depositors. Much larger estimates have been published, but they are wild guesses, without warrant of fact. In three weeks the New York banks suffered a gross loss of \$99,000,000 in cash, but of this about \$35,000,000 was shipped by them to interior points. At Boston and Philadelphia the cash holdings of banks have decreased hardly at all.

GENERAL HESITATION to embark in new enterprises is apparent on every side, but there is an immense volume of business that continues uninterrupted and, like a great fly-wheel, it will shortly steady the erratic movements of other parts of the industrial machinery. Thus, during the six months ending on November 1, the Allis-Chalmers Company, on orders, shipped an enormous quantity of machinery, ranging from 11,886 tons in May to 13,910 tons in October. We are informed that, while there has been some decrease in contracts for future delivery, the receipt and installation of machinery by the large industrial companies continues.

MEXICO is suffering from the financial depression, as is every region dependent upon the health of the money centres. Up to the end of October, everything in the southern Republic seemed on a solid basis, business was good, money was being made cheerfully, and the future was bright with promise. The first sign of trouble coincided with the stop of inflowing money, as was presaged by the check to the big railroad consolidation. Then two or three large enterprises, such as the Guadalajara Electric Power Development Co., and other

undertakings awaiting the aid of foreign money, were halted. This made the banks cautious. Then came the crash in New York and now the local banks will not lend money, restricting themselves to the renewal of old paper, by which method they are extending valuable assistance, but restricting industrial development. There is no sign of a scare and there is every confidence that Mexico's progress is delayed only temporarily.

D ICTIONARIES are not exhilarating literature, nevertheless it is proper that they should be studied by people who undertake to write glossaries of technical words. In the *Yreka Journal* we find a list of mining terms, containing many needless errors, all of which could have been avoided by reference to a dictionary, such as the Standard, for example; we mention this particular dictionary because we happen to know that William Henry Pettee, formerly professor of mining engineering in the University of Michigan, edited the mining and metallurgical terms; and Pettee was a scholar of the most conscientious type. He died in 1904. Our northern contemporary defines 'infiltration' as "the theory that the vein filling is introduced by an igneous fluid and solidified." 'Heading' is given as "the vein above the drift." 'Carbonates' are "salts containing carbonates" and 'cropping out' is defined as "the raising of layers of rock exposed at surface." Other blunders might be quoted; in fact, the glossary is mostly blunders. They are well meant, but more likely to confuse than to instruct. Any dictionary would do better.

The Ore Market.

S MELTER RATES on silicious ores in the West have been raised, both by the smelting companies themselves and the ore purchasing companies. The reason given out is the congestion of traffic on the railroads, causing excessive delay in the transfer of bullion from the Western smelters to the Eastern refineries. For example, at one time as many as 96 cars of bullion were stalled between Salt Lake and Chicago, this amount representing the month's output of a large smelter, such as the Murray plant. The Selby smelter is loaded with silicious ore from Nevada, having received in October four times the amount usually assimilated in its lead-smelting operations. The Salt Lake smelters are similarly situated and, in consequence, some of the Nevada ore is being diverted to Denver. The local rates quoted at Goldfield have gone up by reason of a cumulative increase levied by smelters and samplers; this amounts to over 50 per cent on the lower-grade ores, the increase being credited to the additional cost of freight caused by shipment to more distant points. In the meanwhile every stamp-mill and cyanide annex in Nevada is being examined and overhauled with a view to bringing it into service, for the cost of freight and smelting is so high as to stimulate the ingenuity of the wet metallurgists. We expect to see the smelters relieved of an excessive supply of silicious stuff and we anticipate a further useful development in cyanide practice.

Financial Correctives.

A MONG the absurd suggestions precipitated by the financial crisis, none will amuse mining men so much as that of the hair-brained enthusiast at Goldfield who suggested the stamping of bits of bullion in order to add to the currency. Reference was made to the 'slugs' that passed current in the days of the Argonauts and mention might have been made of the gold dust used even recently as money in the Alaskan mining regions, as it had been employed in the early days of Western exploration and development. Of course, the scheme is impracticable. The minting of money is one of the first perquisites of government, and the difference between coinage and intrinsic values is one of the primary taxes paid by civilized communities. To stamp bullion with its value is to make coin. That is illegal. To circulate bits of bullion without stamping would require weighing at each transaction and even that would be an incomplete precaution, for counterfeit gold is not difficult to manufacture. It will be better to discard such childish expedients for the expansion of a shriveled system of currency and to set to work milling the ore of the rich mines at Goldfield and elsewhere in Nevada. If they produce bullion they need not delay in getting it converted into something better than cubes or pellets of their own manufacture, for the Mint at San Francisco will receive the base bullion and provide its equivalent in United States coin.

Favorable comment has been made on the action of the Federal authorities in putting a large amount of Government securities at the disposal of the banks in order to relieve the stringency in currency. But it may well be asked, if the cause of the depression in 1907 was the boom of 1906, and if the effects of the depression are to be minimized by Federal action, why was not the cause controlled in a similar way? An ounce of prevention is worth a pound of cure. Would not the present panic have been avoided by restraining the boom that gave rise to it, and if we applaud the Government and the President for applying restorativeness today when the patient is sick, would we be equally willing to commend the Federal authorities for a course of action that, if set in motion a year ago, might have prevented the ills which have befallen the body industrial.

The earnest attempts of President Roosevelt to cause people to discern the difference between good corporations and bad corporations, between business and depredation, have been most heartily condemned by the financial people of the East. What would they have said in 1906 if the President had caused the Department of Commerce and Labor to issue a bulletin denouncing the sale of a hundred leading stocks at too high prices, and denouncing twenty-five or thirty prominent flotations as practical swindles? We can well imagine the storm of indignation and protest that would have been aroused by such a proceeding and yet it would have been far more to the point than the course the Government has taken now. It is evident that the public will not

endure the interference of the Government with a view to making financial operations more rational and legitimate during times of expansion and buoyancy; if this be so, then it appears illogical to ask the Government to interfere when things go wrong by reason of financial recklessness.

Periodicity of Panics.

WHEN trouble comes, it is some sort of consolation to know that it must come, and it may be a further solace to be informed that it comes at regular intervals. Economists tell us today that a panic is due every ten years and the talk of decades gives a spurious sort of scientific precision to their vaticinations. But we find that panics occurred in 1857, 1873, 1884, 1893, 1901, and 1907, so that the orbit of a panic is as erratic as that of a comet, being perturbed by factors far beyond our ken.

Panics are accidents that come regularly at the close of a cyclical period of business activity, just as a smash will supervene to a motorist who persists in going too fast along roads of uncertain character. We have seen a typical cycle between 1894 and 1907. First a recovery from the previous collapse, then a slow return of prosperity in the wake of renewed confidence, culminating gradually in a remarkable agricultural and manufacturing output, a rapid increase of gold production, an expansion of export trade, and an extraordinarily favorable position in international exchange. Then ensued an accumulation of capital, which, in turn, stimulated speculation and led to the re-capitalization—on a crescendo scale—of every form of American enterprise. All went merry as a marriage feast, but the pace was too rapid for safety; the first rupture in the chain of business relationships was bound to be a break-down. It came. The over-extension of credit caused a débâcle on the Stock Exchange at New York and that precipitated a financial stringency all over the country. The collapse was primarily due to the destruction of credit in the banking community.

The relation between the New York banks and the New York Stock Exchange is the fruitful source of many troubles. The country banks are compelled by law to hold a specified minimum reserve; in order that the reserve shall not be unproductive, they place it with the New York banks at interest; and the New York banks must use the money where it is subject to call, so they lend on call to speculators. Thus speculation and banking become allied morganatically. Last year the Western banks held credits of \$500,000,000 in New York banks. When an untoward event drives the Wall Street gamblers to cover, they ask the banks for help, and if that appeal comes when the Western credits are needed to move the crops, there is a first cause for a stringency; and if such a combination of circumstances arrives at the close of a period of speculative debauch, everything is ready for a panic, which comes without any regard for the decennial period of the historian or the belated prophecies of the economist.

The relation between speculation and banking gives Wall Street a sinister prominence and leads to a dangerous concentration of financial interests. Banking collateral is placed in an exposed position. The country banks try to draw down their deposits in New York and this undermines the basis of credit. So well is this relationship recognized now that many proposals have been made to remedy it; among sundry alternatives we may mention the asset currency suggested by the Hepburn committee and the idea of a central bank, recommended by a San Francisco banker. Undoubtedly some measures will be taken to adapt the currency system to the expanding necessities of our continental business. We shall hear of many other schemes, and old fallacies will be revived. Already we have Mr. Bryan's proposal of Government insurance of the deposits in national banks and we have the suggestion of a wild man in Nevada that bits of bullion be stamped and circulated.

This sort of hysteria marks the culmination of a panic. Then will come a calm, with signs of temporary stagnation; we shall have a relaxed condition of production, entailing economic waste, but this sequel to the interruption of industrial progress will be brief as compared to previous similar periods, because America is stronger and more self-sustaining than in past times. Agriculture and mining are in a healthy condition, relative to other countries, and the vigor of these basic industries ensures a speedy return to normal conditions. The growling of the bear will be silenced by the bellowing of the bull, and both will once more unite to silence the bleating of the lamb. The human mind oscillates between two extremes, the hope of gain and the fear of loss. As one weakens, the other strengthens. And with a pathetic waste of experience that is so essentially human, people will cease to care whether panics are periodic or not, and they will be as infatuated to accept the idea that panics are intimately related to the appearance of sun spots as to impute them to the human tendency to over-reach, to get something for nothing, to see swans where lame ducks go to water—that water which the Wall Street financier turns into golden wine, and then marvels if the miracle be not repeated.

We conclude that panics have no regular periodicity, they are to be foretold only as a part of the recurrent human cycle of exaggeration and depreciation, of ebullition and prostration, of hope and despair. And so we fall back on the analogy borrowed from geology and liken a panic to an earthquake—for we know them both only too well. According to the State Earthquake Commission: "The cause of these movements in general terms is that stresses are generated in the earth's crust which accumulate till they exceed the strength of the rocks composing the crust and they find a relief in a sudden rupture." Which being translated means that the financial pie-crust of promises to pay becomes too thin to be self-sustaining, so that finally it breaks, permitting a sudden escape of the steam-laden air so closely associated with the indigestible securities underneath, much to the mortification of the financial chefs and the general disappointment of the human family.

By the Way.

In the fifteenth annual report of President Schuman of Cornell University, we find some valuable comment on the education of engineers. He says:

The Director hopes that at least the best students may broaden out their education by electing subjects in the liberal arts in addition to the prescribed curriculum in engineering. Occasionally this will happen, and the President is personally acquainted with a senior in engineering who last year elected a course in metaphysics in which too he did excellent work. Such men derive incalculable benefit from arts subjects, not only because they are capable, earnest, and studious, but also because they are already well-grounded in physical science. The pity of it, however, is that the number of them is so small. Nor can more be expected so long as they are required to take, besides these arts subjects, a technical course which occupies the full time of undergraduates.

The courses in engineering require either 17 or 18 hours for each of the four terms of the first two years, or 70 hours in all. In Civil Engineering 38 of the 70 hours are in Arts and Sciences and in Mechanical Engineering 34. In the junior year the Civil Engineers also take a course in political economy of three hours a week throughout the year—a course which the President has urged should be prescribed also for Mechanical Engineers (for whom next year, at any rate, the Faculty have prescribed a one hour course). If this course of six hours for the two terms be added to the foregoing figures, the Civil Engineers will have 44 hours in Arts and Sciences and the Mechanical Engineers 40.

Excellent as the courses in Arts and Sciences which are taken by freshmen and sophomores in engineering are and have been, and valuable as the education they furnish is, both the courses and the education suffer, from the point of view of general or liberal culture, from the disadvantage of being exclusively in the field of mathematics and physical science.

The modern engineer, if he is to be truly educated, needs a training broader than physical science and technical study. He, too, because he is a man, needs the culture of the humanities—that liberalizing and expansion of mind which comes from the study of literature, history, and philosophy. This, however, he can no longer secure in a four years' technical course. With the constant increase of professional subjects rendered necessary by the advance of engineering science and the practice of modern engineering, the curriculum of the four year course has grown more and more technical, and less place than ever now remains for any of the liberal arts. The result is that, all over the country, men are graduating in the engineering courses with an ignorance of literature, history, and the other liberal arts so dense that no proficiency in science and technology can save them from the charge of being uncultured, especially, when, as so often happens as a necessary result of their limited reading of literature, they are unable to express themselves, either in speech or writing, in correct English prose. Has not the time arrived when the period of study for students in engineering should be extended beyond four years so that students may be required to study the elements of a liberal education before entering upon their strictly technical work? The President believes that along this line the next step is to be taken for improving the education of engineers at Cornell.

Two methods are open, though perhaps only one is feasible at the present time. Either one year or two years of study might be prescribed in addition to the present curriculum of four years, and the time thus gained devoted by the student mainly, if not indeed ex-

clusively, to the humanities. Of technical study he already gets enough in the last two years of the course and of pure science he has enough in the first two years. It has already been shown that of the 70 hours prescribed in the engineering courses for the first two years from 40 to 44 hours are taken in the College of Arts and Sciences, of which all but six in economics are in physical science. What the engineering student needs, therefore, to broaden his horizon and to humanize his culture is the study of literature, history, and other humanities. And he would derive unusual advantage from those studies since, while taking them, he would also be studying the mathematics, physics, and chemistry prescribed in his curriculum. If six years of study were required of him, the student in engineering could complete in the first three years the 40 to 44 hours of science now prescribed and in addition about 50 hours in such humanistic studies as literature, history, political science, etc., while in the last three years he would devote his mind, enlarged and vitalized by the study of the liberal arts and of physical science, to the mastery of the technical subjects in which he could not fail to show a facility and superiority of work which it would be unreasonable to expect and difficult to discover among the students so much less liberally trained, who now pursue the four year courses in engineering. Such a six year course would admit the student to both the A. B. and the C. E. or M. E. degree without any change in the existing rules.

It has hitherto been possible for students to take the arts degree and the engineering degree in six years. A few have availed themselves of the privilege, but the number has always been small. For this and other reasons the President believes it would be going too far at the present time to require all candidates for a degree in engineering to spend six years in study and secure the A. B. degree as well as the professional degree. But the President also holds that it is very desirable that young men should have some college training in language, literature, history, etc., before entering upon their professional studies. And he is disposed to think that the time has arrived when Cornell University might safely insist on a fifth year of study in the engineering courses, the additional time to be spent wholly on humanistic studies during the first two years of the five year course while the student was also pursuing his work in pure science—mathematics, physics, chemistry, etc. This plan would, of course, not be so near the ideal as a six year course, but it would be a great improvement on the present arrangement, and that not only because it afforded to prospective engineers the means of securing at least some culture from the humanities but also because it would infallibly awaken interests and stimulate tastes which would induce them to pursue these studies further in the years that followed. Indeed many of them, noting that two degrees could be obtained by an additional year, might go on to the six year course in arts and engineering, even though at entrance they had not contemplated more than the five year course which the President believes should be prescribed in the near future. With this presentation of the case he recommends the matter to the earnest consideration of the Faculties and Trustees. He himself is persuaded that no improvement which could now be effected in the character of the instruction offered by the technical colleges at Cornell University could compare with the gain which would accrue to those colleges by having the minds of their students nurtured, strengthened, and liberalized as they might be if the students devoted even half their time during the first two years of the course to the English language and literature, history, political science, and other subjects of humanistic culture.

Personal.

H. JULIAN is at New York.

CHARLES BUTTERS is at Washington.

ALGERNON DEL MAR is at South Pasadena.

L. D. RICKETTS was at Hermosillo recently.

ANDRE P. GRIFFITHS is on his way to Brazil.

W. A. CALDECOTT returned to London on the *Baltic*.

W. H. ARGALL has returned from Uraquay to London.

F. T. BYRDE has returned to London from Liberia, in Africa.

EDWARD JUSSEN has returned to Spokane from Ely, Nevada.

JOHN OVERBERRY has returned to San Francisco from Goldfield.

FRED. B. REECE has returned to Denver from a holiday in Europe.

CHARLES D. KAEDING, recently in Korea, is now at Goldfield, Nevada.

FRANK W. OLDFIELD has returned to Los Angeles from Prescott, Arizona.

C. L. HARGRAVE is assayer at the Combination mine, Goldfield, Nevada.

H. C. CARR is superintendent of the Herman mine at Westville, California.

LEE S. WOODS is manager of the Green Mountain mine, near Silverton, Colorado.

SARAT C. RUDRA is operating in Sierra county, but his office is in San Francisco.

JOHN E. HARDMAN, of Montreal, has been examining mines in New Brunswick.

L. N. B. BULLOCK is returning to Copala, Mexico, after a visit to his home at Halifax.

O. N. FRIENDLY is an assistant engineer for the Daly West mine, at Park City, Utah.

H. L. SWAIN is manager for the Pacific Copper Co. at Zihuatanejo, in Guerrero, Mexico.

C. W. PURINGTON is on his way from Vladivostok to London, by way of St. Petersburg.

JOS. T. WOLFE, chief engineer for the Tonopah Mining Co., in Nevada, is in San Francisco.

CHESTER NARAMORE, in the Denver office of the U. S. Geological Survey, is now at Washington.

F. B. CLOSE, until recently general manager for the Helvetia Copper Co., Arizona, is in Sonora, Mexico.

W. R. BASSICK, whose office is at 605 Atlas Bdg., San Francisco, is the local agent of the Bucyrus Company, of South Milwaukee.

ROBERT B. BRINSMADE has been selected as president of the State Mining School, at Platteville, Wisconsin. He is a graduate of Washington University and Lehigh.

G. L. EDDY, recently assayer for the Mountain Copper Co., at Keswick, Shasta county, has accepted a similar position with the Confidence mine in Tuolumne county, California.

Obituary.

DANIEL T. MONTGOMERY, a native of Rock Island, Ill., died at Vantas, State of Durango, Mexico, on October 30, at the early age of 25 years. He was the son of Mrs. Jane T. Montgomery. His mother, five sisters, and three brothers survive him. For two years past he was engaged by David John Pullinger of London, England, as field assistant to F. C. Roberts. He had attended the Colorado School of Mines and later graduated from the mining engineering department of the University of California. He was a skillful engineer, possessed of high ideas of honor and integrity, a gentle and charming companion beloved by all who met him, a truly Christian man, whose premature death is not only a severe loss to the engineering profession, but is deeply regretted by all with whom he came in contact.

Latest Market Reports.

LOCAL METAL PRICES—Nov. 27.

Antimony.....	13@17c	Quicksilver (flask).....	\$45.50
Casting Copper.....	18@19c	Spelter.....	7@ 7.75c
Pig Lead.....	4.50@ 5.45c	Tin.....	39½@41c

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.

Date	Electrolytic Copper	Lead	Spelter	Silver
Nov. 22.....	12¼	4.23	4.88	58¾
" 23.....	12½	4.20	4.83	58¾
" 24.....	Sunday. No market.			
" 25.....	13¼	4.18	4.78	58¾
" 26.....	13¼	4.18	4.73	57¾
" 27.....	13½	4.18	4.70	57¾
" 28.....	Legal holiday. No market.			

ANGLO-AMERICAN SHARES.

Cabled from London.

	Nov. 20.	Nov. 27.
	£. s. d.	£. s. d.
Camp Bird.....	0 16 0	0 15 6
El Oro.....	1 2 0	1 1 3
Esperanza.....	1 11 0	1 10 3
Dolores.....	1 0 0	1 0 0
Oroville Dredging.....	0 14 4½	0 14 3
Stratton's Independence.....	0 2 9	0 2 9
Tomboy.....	1 7 6	1 9 3

(By courtesy of W. P. Honbright & Co., 24 Broad St., New York.)

COPPER SHARES—BOSTON.

Closing prices.

Nov. 27.

Closing prices.

Nov. 27.

Adventure.....	1½	Michigan.....	8
Ahmeek.....	45	Mohawk.....	46
Allouez.....	24	Nevada Con.....	7½
Amalgamated.....	49	North Butte.....	38
Arcadian.....	3	Old Dominion.....	23
Atlantic.....	9	Osecola.....	80
Balaklala.....	17½	Parrot.....	91½
Bingham Con.....	4½	Phoenix.....	8½
Boston Con.....	...	Quincy.....	77
Butte Coalition.....	11½	Raven.....	...
Calumet & Arizona.....	96	Rhode Island.....	2½
Calumet & Hecla.....	555	Santa Fe.....	13¼
Centennial.....	20½	Shannon.....	97½
Con. Mercur.....	26	Superior & Pittsburg.....	8½
Copper Range.....	51½	Tamarack.....	60
Daly-West.....	9½	Trinity.....	9½
Franklin.....	7½	United Copper com.....	7
Granby.....	70	Utah Copper.....	15½
Greene-Cananea, etc.....	5½	Victoria.....	4½
Isle Royale.....	15½	Winona.....	3½
Mass.....	2½	Wolverine.....	108

MINING STOCK QUOTATIONS—NEW YORK.

Closing Prices.

Nov. 20.

Nov. 27.

Bingham Central.....	1¼	1¼
Boston Copper.....	9½	10
Cumberland Ely.....	5	5
Dolores.....	5	5
El Rayo.....	13¼	13½
Guanajuato Con.....	2¼	2½
Giroux Con.....	3	2½
Greene Cananea.....	5½	...
Nevada Con.....	6½	7½
Nipissing.....	5½	5½
Tennessee Copper.....	23	26
Tonopah Ex.....	1	1½
Tonopah-Belmont.....	9¼	1
Tonopah.....	7½	6¾
United Copper.....	7½	7
Utah Copper.....	14	15½

(By courtesy of Hayden, Stone & Co., 25 Broad St., New York.)

SOUTHERN NEVADA STOCKS.

San Francisco, Nov. 27.

Atlanta.....	\$ 21	Laguna.....	75
Belmont.....	90	Manhattan Con.....	23
Columbia Mtn.....	16	Midway.....	43
Combination Fraction.....	80	Milzpah Extension.....	10
Daisy.....	77	Mohawk.....	8.00
Fairview Eagle.....	63	Montana Tonopah.....	1.35
Florence.....	2.70	Nevada Hills.....	3.00
Gold Bar (Bullfrog).....	3	Red Top.....	2.00
Goldfield Con.....	3.80	Sandstorm.....	20
Goldfield of Nevada.....	...	Silver Pick.....	23
Gold Kewanas.....	24	St. Ives.....	39
Great Bend.....	26	Tonopah Extension.....	1.10
Jim Butler.....	43	Tonopah of Nevada.....	6.75
Jumbo.....	2.00	Tramp Con.....	18
Jumbo Extension.....	60	West End.....	31

(By courtesy of W. C. Ralston, 368 Bush St.)

General Mining News.

ARIZONA.

COCHISE COUNTY.

(Special Correspondence).—The flow of gas, encountered on the 16th in the various shafts of the Copper Queen Consolidated Mining Co. and the Calumet and Arizona Mining Co., has been completely overcome by compressed air lines introduced into the lower levels of the shafts. For two days the men were unable to stay in the drifts owing to the great amount of gas on the 950 and 1,050-ft. levels of the Irish Mag and the 600 and 700-ft. levels of the Spray and Gardiner shafts. A number were overcome by the fumes, but soon gained consciousness when brought to the surface. A difference of opinion exists in regard to the character of the gas, but it is generally supposed that it originated in the unworked stopes, caused by water from the surface coming in contact with the decomposing sulphides. For a long time a block of ground comprising about twenty acres and down to a depth of 500 ft., between the Czar and Spray shafts of the Copper Queen Company, has been slowly sinking, varying in places from six inches to three feet. This left huge cracks on the surface into which the waters of the recent rains poured, coming in contact with the sulphides, and probably caused the gas.—Diamond-drill work, which has been vigorously pursued for the past month on the flats of the Warren Realty & Development Company's property has reached the 500-ft. level and still shows only the gravel wash from the mountains.—A blaze was discovered coming from the shaft of the Shattuck-Arizona Mining Co. at about one o'clock on the morning of the 20th. Efforts were made to quench the flames with water, but to no avail. An entrance was attempted from the Cuprite shaft of the Copper Queen Company, but owing to the dense smoke had to be abandoned. After fighting the flames for about twelve hours a plan was suggested to smother the fire by closing all entrances to the mine. This was successful. The estimated loss to the timbers and machinery of the mine is about \$20,000. The fire bears no relation to the gases, which the Calumet and Arizona and the Copper Queen companies have been fighting the past week, as the Shattuck lays more than a mile distant from these properties. The origin of the fire is unknown, as there were no men in the mine after four o'clock of the previous day, there being only a day-shift working during the curtailment in production. It is generally supposed that it started from spontaneous combustion from the gases in one of the stopes.—The machinery of the machine shops of the Calumet & Arizona Mining Co. has been moved from the old shops at the Irish Mag shaft to the new shops at the Junction shaft.—The steel frame-work for the large new power-house of the Copper Queen Consolidated Mining Company has been completed. Bisbee, Nov. 21.

A body of copper-bearing sulphide ore has been found on the 900-ft. level of the Emerald mine, belonging to the Tombstone Consolidated M. Co. This orebody is about 200 ft. below water-level; the ore carries some silver. The amount of water being pumped daily at the Tombstone Consolidated is 500,000 gal. less than it was Oct. 1; the water-level is being gradually lowered.—It has been impossible to ascertain as yet (Nov. 24) the extent of the damage at the Shattuck mine at Bisbee, as the bulkheads are still in place. The working forces at the Bisbee mines are about the same as last week. At the Wolverine & Arizona the drift, developing the orebody discovered about two months ago, has passed through 125 ft. of ore.—Some stringers of rich ore have been found on the 65-ft. level of the North Bisbee property in Tombstone canyon.

YAVAPAI COUNTY.

Judge Lanning, of the United States Court, at Trenton, N. J., has appointed J. Kearney Rice, of New Brunswick, N. J., receiver for the Arizona Smelting Co. and the Consolidated Arizona Smelting Company.

CALIFORNIA.

AMADOR COUNTY.

At the Valparaiso a large station has been cut at the end of the adit, which is 200 ft. long. This station is large enough for a horse-whim to be operated in it. A winze has been sunk at this point; this is at present 25 ft. deep and will be continued to a depth of 100 ft. before commencing to drive on the vein. Several rich pockets of ore have been found along the adit, but these appear to be worked out; as the Mammoth mine, which joins the Valparaiso on the south, had many pockets of ore below the present level being worked at the Valparaiso, it has been determined to also develop this property in depth.

CALAVERAS COUNTY.

At the Chapman mine, on the main San Andreas channel, the adit is being rapidly advanced.—At the Central Hill mine, the mill is working full time on gravel coming from this drift mine.—At the Cassinelli mine, near the North Star mine, the old channel has been cut. The gravel is quite rich and the channel is large.—At the North Star mine new machinery is being added to the plant.

NEVADA COUNTY.

(Special Correspondence).—A new compressor has been installed at the Empire, and the pumping capacity increased. These additions are expected to enable the property to be operated continuously throughout the winter. The 40-stamp mill is running constantly on good ore. George W. Starr is superintendent.—The Central shaft is now 5,000 ft. deep, and is still being sunk. Development work is being done at several points; the vein is looking well.—Considerable work is being carried on at the Sultana group, and a large force of men is employed. Operations are carried on through the Prescott Hill shaft. C. K. Brockington is superintendent.—The new five-stamp mill at the Austin has been completed. The mill was built in 15½ days, which is claimed to be the State record. As soon as the pipe-line is finished crushing will commence.—The Grey Eagle Co. is making preparations to install a hoist, concentrator, and sand plant at their property, near Maybert. C. C. Weisenburger, R. L. Hathaway, and John Anderson of Nevada City have obtained a contract to improve the mill. The property is looking well, and the 10-stamp mill is running on good ore.—Excellent ore is being developed at the Mountaineer mine. The company controls a large area of rich territory; the main vein is showing up well.—Owing to the financial stringency several small properties of this district have been compelled to temporarily suspend activities, while the pay of the men is delayed at many others. The larger mines have been shipping their bullion to the Mint at San Francisco, and by this means have succeeded in obtaining sufficient gold coin to meet their requirements.—Men are pouring into Grass Valley and Nevada City from many other camps, and work is becoming scarce. The largest influx is from Arizona and Nevada points.

Grass Valley, Nov. 25.

The Aurora mine at Randolph Flat has closed down temporarily. The shaft is now 41 ft. deep and follows a vein 2 ft. wide, which is of good grade. As soon as the financial flurry is over, work will be resumed.—A. A. Charonnat, superintendent of the Canada Hill and the Grey Eagle mines, near Maybert, has located a new claim above the Grey Eagle. While climbing a hill he tripped on a rock which, upon examination, proved to be quartz carrying some free gold. This will be developed immediately.—Michael Hogan has struck good ore in a shallow shaft on his claim, the Hendrick, east of Grass Valley. The vein-filling is 7 ft. wide, 3 ft. of which is of milling grade. This property adjoins the old Eureka mine.

For the first time in 40 years many white men are working with rockers along the banks of the South and Middle Yuba rivers above Nevada City. For years past Indians and Chinamen have mined along the river. Invariably, when asked what they were making, they said four to six bits per day. This was believed, but the results of the work this fall has led white men to think that the Chinamen have made good

MICHIGAN.

KEWEENAW COUNTY.

The No. 2 shaft on the Kearsarge lode being sunk by the Allouez M. Co. is now 900 ft. deep. The work is being somewhat delayed by the fact that the trap rock, through which the shaft is now passing, is much shattered and large slabs break away from the sides, requiring the handling of more rock and necessitating more timber to fill these places. At 200 ft. this shaft passed through the Osceola amygdaloid, but at that point the amygdaloid is unpromising. The No. 2 shaft is about 1,000 ft. west of the line of strike of the strata at No. 1 shaft. The shaft was so placed, owing to the heavy flow of water met at the locality first chosen. The sixth level of No. 1 shaft is now considerably east of the projection on it of No. 2 shaft. A cross-cut is to be driven to meet No. 2 shaft, which will be at a point 1,750 ft. below surface. This drift will be driven with a grade toward No. 2 shaft. A large hoist, having a drum 14 ft. diam., is to be installed at No. 2 shaft. This hoist was formerly used at one of the C. & H. shafts.

NEVADA.

ESMERALDA COUNTY.

The output of the Goldfield district for last week was 5,801 tons of an estimated value of \$674,200. The different properties shipped the following tonnages: Mohawk Combination, 3,490; Mohawk, 1,046; Rogers Goldfield Syndicate, 132; Florence L. & M. Co., 57; Diamondfield Black Butte, 18; Florence Annex, 36. The Combination mill treated 595 tons; the Kinkead mill treated 125 tons.—Neither the Mohawk-Jumbo nor the Little Florence are shipping.—The Florence Annex Co. shipped from its lease on the Cornishman and Firelight claims the richest car of unsorted ore ever shipped from Goldfield. The car contained 40 tons of ore assaying \$948 per ton, a total valuation of \$37,920. The ore came from the 300-ft. level. The record shipment made last winter by Hayes & Monnette was of sorted high-grade ore, that had been saved for several months. As the Florence Annex Co. has obtained enough money from its shipments to work its lease for a considerable length of time, it has decided to store its ore at the mine until the smelters are able to make settlements within a reasonable time. Development continues on the 400 and 500-ft. levels; last week the vein was cut on the 400-ft. level and a drift on the vein has been started; as yet no high-grade has been found on the 400.—The frame structure for the Florence mill is almost completed. As yet the machinery for the mill, although ordered long ago, has not arrived.

The Consolidated is still hunting for a mill. The company has decided to stop shipping until smelting charges are reduced. All miners at the Mohawk, who were working in ore, have been put on development work. The Red Top and the Combination mines are stoping, as the ore is treated in the Combination and Kinkead mills and not shipped. The company will not begin to build its proposed mill until another level, the 600 ft., has been developed. A winze is being sunk from the 450-ft. level of the Mohawk and also one from the 520-ft. level; both are entirely in ore.—What is thought to be the continuation of the Red Top vein has been found in the Macmillan-Halloran lease on the Miss Jessie claim of the Laguna group. The vein was cut in the shaft at a depth of 365 ft. but was quite low-grade; at the present depth, 404 ft., the ore has improved until it is almost of shipping grade. On the 400-ft. level driving will begin soon; the shaft will be sunk another 100 ft.—The Little Florence Co. has cut the orebody on the 625-ft. level; a cross-cut, 20 ft. long, has been driven without sign as yet of the hanging wall. The ore is of shipping grade.—At the Sandstorm mine the Parkison & Erbel are sorting out 50 to 80 sacks per day from the ore hoisted at their lease.—Last week a vein of rich ore was cut at a depth of 110 ft. in a shaft on the west side of Red Mtn., which is about 3 miles east of Diamondfield and about 7 miles northeast of Goldfield. This is on the property of the Diamondfield Red Mountain M. Co. On the nearby Butte Boys claim good ore has been found at a depth of 260 feet.

NYE COUNTY.

The shipments from Tonopah last week were as follows: Tonopah Mining Co., 909 tons; Tonopah Extension, 95; Belmont, 105; Jim Butler, 96; Midway, 104; total, 1,309 tons. The Tonopah company sent 2,650, the Belmont Co. 1,050, and the Montana-Tonopah Co. 1,260 tons of ore to the mills this week. This makes a total shipment for the week of 6,169 tons; assuming that the shipping ore assays \$70 per ton and the milling ore \$30 per ton, the production was \$240,130.—Richard G. Park of Philadelphia has been elected president of the Tonopah-Belmont Development Co. to succeed John W. Brock. About a month ago a 3-ft. vein was discovered on the 800-ft. level in the Occidental claim at a point about 800 ft. southeast of the Desert Queen shaft; but the recent rumor in regard to a new discovery near that point has not been confirmed. This ore is of good milling grade. The diamond-drill hole, being drilled from the 900-ft. level, is 200 ft. deep; progress has been delayed by the shattered condition of the ground. Forty stamps at the 60-stamp mill belonging to the Belmont company at Millers were crushing last week.—At the West End Consolidated the station of the 320-ft. level in the new two-compartment shaft has been completed. Last week the drift from the 275-ft. level of the old shaft, broke into the 320-ft. station of the new shaft. Sinking has been resumed in the new shaft. This has been equipped with a cage; for the present only waste will be hoisted through the new shaft, while all ore is hoisted through the old one. Stoping is being pushed on the 400-ft. level.—At the Midway the new vein, recently found on the 800-ft. level, is being developed; the ore is high-grade and the vein quite large. Most of the ore at present stoped comes from the 435-ft. level. The north cross-cut on the 1,050-ft. level of the Tonopah Extension is progressing rapidly; several stringers of good ore have been cut recently. Stoping is being done on all the levels above the 600.

In the Bullfrog district affairs are in much the same condition as last week. The Colorado Iron Works of Denver has secured the contract for the Homestake mill. This will be a 25-stamp mill and will cost, including the pipe-line to supply water, about \$200,000. The contract calls for the completion of the plant by April 1, 1908. The ore will be crushed by gyratory crushers, stamps, and tube-mills and will be amalgamated and cyanided. Two Hendryx agitators and a Butters filter will be used.—Some very rich ore has been found in the cross-cut recently started at the National Bank. The streak of shipping ore is 2 ft. wide.—The Shoshone mill is treating 150 tons of ore per day. As soon as the new screens for the mill arrive, another shift will be put to work at the mill.—The Gold Bullfrog M. Co. has struck a good flow of water at Sardora spring, about 1,900 ft. from the company's mill. This will furnish plenty of water in the future for the mill.

BRITISH COLUMBIA.

The Consolidated M. & S. Co. of Canada, Ltd., has declared a quarterly dividend of $2\frac{1}{2}\%$; this dividend amounts to \$133,880, making the total dividend paid to date by this company \$848,825. The Consolidated company operates the Centre Star-War Eagle mines at Rossland, the St. Eugene mine at Moyie, the Eureka group near Sandon, the Snowshoe-War Eagle groups near Phoenix, and the Trail smelter and refinery.

BOUNDARY DISTRICT.

The output of the mines for October was as follows: Granby mines, 86,711 tons; B. C. Copper Co. (Mother Lode, 17,909; Emma, 5,697), 23,606; Dominion Copper Co. (Rawhide, 8,287; Sunset, 2,979; Mountain Rose, 95), 11,359; Snowshoe, 25,025; Riverside, 30; total, 146,731. Assuming that the Boundary ores averaged 23 lb. copper per ton, the production of the Boundary mines was 3,604,713 lb. This week the Boundary mines have laid off most of the miners, about 2,000 men being discharged. Preparations are being made to blow out the furnaces at the smelters. The Granby company has laid off 900 men, 550 of whom worked at the mines. At the Snowshoe mine 150 miners were laid off.

EAST KOOTENAY DISTRICT.

At the Sullivan smelter, situated at Marysville, three new furnaces are to be installed; this will double the present capacity. The smelter now treats 120 tons per day. A reserve of 8,000 to 10,000 tons of ore is kept at the smelter in case of trouble at the mine, but at present the mine easily sends 120 tons daily to the smelter. Recently a good body of ore has been discovered north of the old workings on the 100-ft. level. A shaft is being sunk; at present this is 140 ft. deep. As soon as this reaches the 300-ft. level a cross-cut will be run to the present workings. About 50 men are working at the mine.

The ore shipments during the last week from the East Kootenay district were as follows: Sullivan, 600 tons, making a total for the year to date 27,000 tons; St. Eugene, 663, making a total of 21,450; North Star, 71, making a total of 2,751. The Sullivan and the St. Eugene are the largest lead mines in British Columbia at present producing.

ROSSLAND DISTRICT.

The shipments from the Rossland mines last week amounted to 6,365 tons. The Centre Star shipped 3,635 tons; Le Roi, 2,135; Le Roi No. 2, 595. The shaft at the



Map of Part of British Columbia.

Idaho mine is 245 ft. deep and is still in ore. The orebody on the fourth level of the Idaho is looking well as development proceeds.—The 600-hp. Westinghouse synchronous motor, which has been installed to run the air-compressor at the War Eagle is working finely, as is also the 650-hp. induction motor installed at the Centre Star. The Nickel Plate compressor has been shut down. The Le Roi company has stopped prospecting with the diamond-drill at the Splitzee mine, but it will be resumed later. The section of the mine west of the Josie dike has been developed in four levels for a distance of 300 to 400 ft. west of the dike and a considerable tonnage of good ore has been developed.

SLOCAN DISTRICT.

The Kootenay Ore Co.'s plant at Kaslo has enough ore on hand to keep it running for four months.—The Canadian Zinc Co. intends to complete its experimental plant near Nelson. This plant will use electric smelting for reducing ores.—At the Rambler-Cariboo mine, 45 men are working; five carloads of high-grade ore, which came from development work on the 8th and 9th levels, were shipped last week.—At the Bluebird property, on Woodbury creek, belonging to Erle Johnson, five men are working. A cross-cut is being driven to develop the vein in depth.—The Ruth mine and mill are working, but the concentrate is being held at the mill awaiting shipment to the Kootenay Ore Co.'s zinc mill. The Ruth mill will run as long as the

supply of water lasts. About the same-sized force of miners will be kept at work all winter.

MEXICO.

CHIHUAHUA.

The Granadena mill is crushing from 70 to 80 tons of ore per day from the Mercedes mine and making about 12 tons of first-class concentrate.—The American S. & R. Co. is rushing the bullion from its smelter to the United States mint, but the silver and copper is being held.—Owing to the shut-down at Cananea and other camps in northern Mexico, there is plenty of Mexican labor available now. Many companies are preparing to do much development work while this labor is available.—Anderson & Scabell are shipping to the Torreon smelter three cars of ore weekly from their Santa Elena mine at Terrazas, 25 miles north of Chihuahua. The shaft is at present only 50 ft. deep.—The Lluvia de Oro Gold M. Co. has purchased a complete power-plant for its mines and reduction works. The main unit is a 500-kw. alternator, directly driven by an Allis-Chalmers steam turbine.

(Special Correspondence).—The mines and smelter of the Rio Tinto M. & S. Co., are at Terrazas, 25 miles north of the city of Chihuahua. The orebodies on this property have been developed by vertical shafts, gasoline hoists being used. The deepest work is the 300-ft. level, but most of the ore mined has come from the 200-ft. level. The ore occurs as lenses in limestone, close to the contact of this limestone with porphyry, and consists of copper carbonates in a gangue of calcite and garnet. It is said to carry from 2½ to 3% copper, together with gold and silver amounting to \$4 per ton. The mine is an old one; the more recent operations began two years ago. The present smelting plant was erected at that time under the direction of David Goodale, manager of the company. One copper furnace has been in operation for some time, but the plant was closed down a week ago by reason of the slump in copper prices. Smelting will probably be resumed within the next two months, as Mr. Goodale states that his company can make money with copper at 14c. per lb. In the meantime the company is sinking in the hope of reaching the sulphide ores. A second copper furnace is on the ground and it may be installed next year. The headquarters of the Rio Tinto company are in New York City, M. J. Condon being president.—The San Rafael mine, where the formation is similar to that at the Rio Tinto, is being developed by three vertical shafts. J. P. Hutchinson and M. D. Murray are concerned in these operations.—The Columbia, lying west of the San Rafael, is owned by the Drogoon M. Co. of New York. It has been under lease to Felix McDonald, who has mined \$75,000 worth of ore from it within the last two years. Mr. McDonald formerly owned the Wisconsin and Shamrock, which were purchased some time ago by E. M. Ray as the representative of Mr. Barnsdale, of Pittsburg. Mr. Ray is at this time at Chihuahua on business for Mr. Barnsdale in connection with this purchase. The properties in question are producers of silver and lead ores of good grade, much of which is said to be below water-level. It is planned to resume work next spring but pumps will have to be installed first. These properties are about a mile from the Rio Tinto and are also in limestone.

Terrazas, Nov. 22.

DURANGO.

Much ore has been blocked out in the La Perla mines in the Topia district. These mines were purchased by M. E. and Bernard MacDonald, of Guanajuato, about a year ago, and the La Perla Mining Co. was organized to operate them, but none of its stock has been put on the market. The ore is silver-lead, and quite high-grade; at present the Topia district is far from a railroad.

GUANAJUATO.

Three new winzes are being sunk from the deepest level of the Pinguico mine; all are in good ore.—Development is being pushed on the San Gregorio property in the La Luz district.—The smelter at Aguascalientes announces that, if the financial stringency lasts much longer, it will be unable to receive any more high-grade concentrates from Guanajuato.

Special Correspondence.

Chicago.

The Mining Congress.—Character of the Attendance.—A Review of the Work Accomplished.—The Resolutions.—The Bureau of Mines and the Geological Survey.

The tenth annual session of the American Mining Congress closed at Joplin on Saturday last. In certain particulars the meeting was unusually successful. The attendance was large and representative. While Governor Folk alone among the State executives was present, and while congressmen and senators were practically absent, all phases of mining were more or less completely represented. The promoter and stock peddler were there, but in a hopeless minority. Miners, operators, smeltermen, and millmen, official geologists and consulting engineers, mine owners, and mining lawyers, were all present. A new feature was the attendance of an earnest minority of oil men, mainly from the neighboring mid-continental oilfields. There were a few coal men, though only a few, and in general the great mining interests of the Central and Eastern States, except the lead and zinc, were unrepresented. The Congress was Western in spirit and membership, and devoted most of its energies to problems most closely related to the mining of the precious metals or to the public lands of the West. If the organization is to become truly national in scope and importance it must attract the support of a large and, as yet, uninterested group of Eastern and Central men who are concerned in coal, iron, Lake Superior copper, and the various non-metallie products. If this be done the Congress will be truly national, and as such its recommendations will have a new importance. As matters now stand the action of the Congress must be considered merely as representing the organized opinion of the Western mining States. In this light it is interesting to review its work.

A long and varied program was prepared, but not all the papers were read. Two, those of Buckley and Mitchell, were primarily of local interest. The great majority of the remainder, particularly of those actually read, dealt with Western problems. Of the special committees reporting, four dealt with essentially Western problems, smelter rates, side-line laws, protection of investors, and accidents in metalliferous mines; only one, the committee on accidents in coal mines, dealt with problems of larger interest in the East.

An informal gathering such as this expresses itself most concretely in its resolutions, and here again the same comparison holds. A resolution favoring a tariff on zinc ore was to have been expected from a meeting in Joplin. So too, perhaps, locality favored a resolution calling on Congress to remove some of the anomalies of law and regulation met by the Oklahoma oil and gas producer. The strong resolution calling for a thorough revision of the land laws and proposing temporarily that mineral title be reserved in all lands patented as non-mineral, was Western. The hearty approval given the President in his general policy of conserving the undeveloped resources of the country seems also to represent the best sentiment of the West.

The resolutions asking for a Bureau of Mines and for the expansion of the work of the Geological Survey may also be taken as thoroughly representative of Western thought. Incidentally the usual resolutions of thanks were passed and the Congress wisely concluded to abandon its general Bureau of Information and to allow no opinions or advice regarding properties to be given by any officer of the organization in his official capacity.

The main interest centred in the resolution regarding the proposed Bureau of Mines. As is well known, the Congress has worked persistently for the establishment of a Department of Mines along the lines of the Department of Agriculture and to be headed by a cabinet officer. Ten years of agitation of this sort seems not to have produced any tangible result. Considerable importance therefore attaches to the change of front indicated by the simultaneous demand for a bureau devoted exclusively to mining and for further support of the Geological Survey. The two bureaus would constitute an excellent nucleus around which a Department might later be made. It is understood that President Roosevelt will recommend the establishment of such a bureau and that the chance of seeing it established by the present Congress at Washington are unusually good. It may be noted that the re-establishment of the office of Commissioner of Mines, even with somewhat different duties, would be pleasingly reminiscent of an earlier period of American mining. If we can have a commissioner as able as R. W. Raymond was, the office will certainly justify its creation and the mining industry will be benefited.

Salt Lake, Utah.

Coinage of Silver.—A Public Movement.—Views of Solomon Guggenheim.—Effects of Smoke Decisions.—Shipments From Park City.—The Yampa Smelter.

A movement, having for its object the coinage of a large amount of silver as a means of relieving the present financial stringency throughout the country, has been inaugurated here during the past week and the Commercial Club has called a meeting of prominent citizens at which Solomon R. Guggenheim, of the American Smelting & Refining Co., will be invited to speak. In fact, the idea of silver coinage as a remedy for some of the existing financial ills was suggested by Mr. Guggenheim himself in an interview with the representatives of several Salt Lake daily papers. The smelting man believes that if the Government should immediately purchase and coin, say 50,000,000 oz. of silver and place it in circulation, it would have the effect of clearing up the situation very materially. "There are many reasons," said Mr. Guggenheim, "why such a step should prove to be a good one. To begin with, the gold supply at the present time is inadequate to cope with prevailing conditions; whereas, coined silver, having the guarantee of all the gold in the treasury at Washington behind it, would prove as good a substitute as the gold itself. In offering my opinion I have France in mind as an example of a country where such a system has been found to work well. It is a fact that there have been times when money in New York commanded interest at the rate of 50%, while in France, on the same day, the amount could have been obtained for 3%. This is by reason of the fact that France keeps a large reserve silver coinage at all times and when necessary pays this out just as it would gold. Suppose such a plan were in operation here. While in large amounts silver might prove inconvenient as a medium, yet I do not believe under the circumstances there would be as many objections as found now in the matter of the acceptance of cashiers' checks. Another point: While both the production and coinage of gold have increased in proportion to its usefulness and the country's needs, silver has not. There are now no new silver dollars being minted, and probably under ordinary circumstances none would be for some time to come. A few years ago, the production of silver was to gold in a ratio of about 23 to 1. At this time it is 8 to 1. This fact alone is an added reason in

favor of an increased silver coinage. These are perhaps the main reasons why I think such a plan would prove a good one and such men as I have spoken to along these lines heartily agree with me. The matter would, of course, have to be brought to the attention of the Government in the proper manner, and if this were done I see no reason why the plan should not be entertained. I do not wish to be understood," concluded Mr. Guggenheim, "as advocating absolute free coinage of silver."

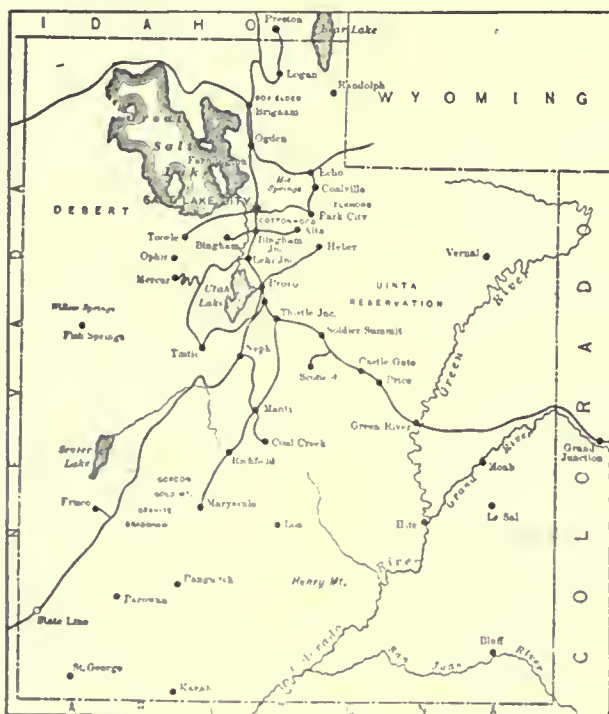
In discussing the forthcoming meeting Secretary Fisher Harris of the Commercial Club said: "Make as emphatic as possible the statement that this movement is absolutely divorced from politics. It is absolutely free from a desire or intention to bring about free coinage of silver. The sole object is to relieve the financial stringency through the purchase and coinage of a quantity of silver bullion. It will help the West, of course, but that is a mere incident. There is no free silver and there is no politics in the movement."

There has been a great deal of talk about the United

a large percentage of iron, are in demand. The American company is taking care of some of the Goldfield and Tonopah ore under contract at its Colorado plants.

Work has commenced on the zinc plant to be erected by the Grasselli Chemical Co., at Park City. The ore to be treated will come for the present entirely from the Daly Judge mine. This company has 150,000 tons of zinc middling on the dump that will average between 15 and 20% zinc.—Ore shipments from Park City last week amounted to 1,408 tons, the contributing mines being: Silver King, 944; Daly Judge, 464 tons.

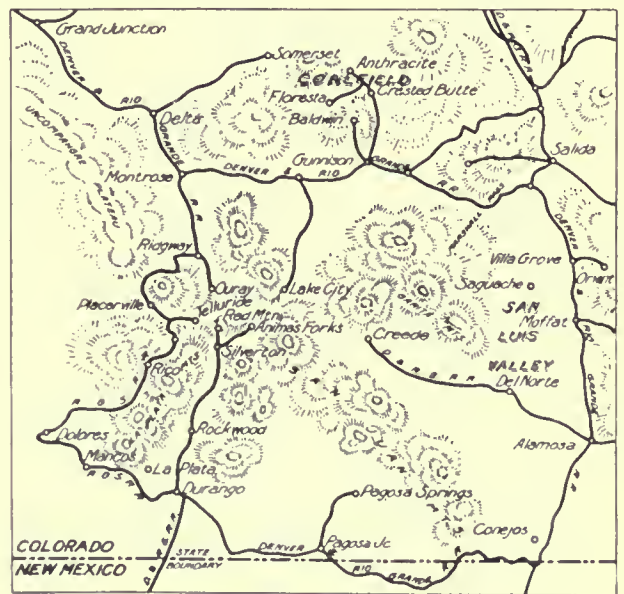
The Yampa smelter at Bingham is being warmed up again after a shut-down of about six weeks. The plant will be in full operation in about 10 days, by which time the new 12,000-ft. aerial tramway will be ready. The capacity of the plant has been raised from about 400 tons to 750 tons of ore daily. The tramway will be operated between the mine and smelter and will remove the necessity of depending on the Rio Grande Western railroad for transportation.—A new electric hoisting plant is being installed in the Humbug mine of the Uncle Sam Consolidated Mining Co., in the Tintic district.—Notwithstanding that the Colorado Mining Co., of Tintic, was requested to curtail its output for a time, the man-



Utah.

States Smelting, Refining & Mining Co. retiring from the smelting business in Utah. A statement has come from one of its chief officers to that effect, but here in Salt Lake the situation is not regarded as serious. The courts have allowed the American Smelting & Refining Co. to continue the operation of its lead smelter at Murray under a modified decree, and it is believed that some such an arrangement will be granted to the United States company. In fact, negotiations toward that end are now pending, and there is every reason to believe that they will be successful. The chances are that the copper smelter belonging to the United States company will be moved elsewhere, that is, outside the Salt Lake valley.

The management of the American Smelting & Refining Co. has taken occasion to enter a denial of its reported intention of closing either or both of its Utah smelting plants. On the contrary, both of them are running up to their furnace-capacity, and will continue to do so, with the probability of adding more furnaces. The statement has also been made that the company is not taking on any more contracts from Goldfield and other Nevada camps where silicious gold-silver ores are produced, for the reason that the company's yards have become clogged with this class of ore. Copper ores, however, that carry



Map of Southwestern Colorado.

agement has announced that its monthly dividends of \$60,000 will be continued.—The Cave silver-lead mine in Beaver county has been sold to a syndicate of Denver and Pittsburg parties. It is one of the oldest mines in the State, and is said to have produced more than a million dollars.

Denver, Colorado.

Important Engineering Work.—Prospecting in Gilpin.—Lower Rates of Treatment.—Lost Bullion Case.—Old Mines Reopened.

The Secretary of the Interior, James R. Garfield, has announced that the United States Government will construct a \$1,500,000 high-line irrigation canal beginning at the foot of Mt. Garfield and extending to the Utah line; \$50,000 has already been set aside to establish engineering headquarters at Grand Junction. The survey and the accumulation of necessary data will be begun at once. E. E. Sands, constructing engineer of the Reclamation Service, who is now supervising work on the Gunnison tunnel, will have charge of the survey. This canal will reclaim 70,000 acres of arable land in Grand Valley adjoining Grand Junction.—Prospecting and development work is being pushed ahead in Gilpin, Clear Creek,

and Boulder counties with unusual vigor. New concentrating plants are being erected at Georgetown, Silver Plume, Central City, and Eldora. The Central, Metropolitan, and McClelland tunnels are all being advanced rapidly to completion. The principal strikes of late have been silver-lead and gold ores. Owing to the scarcity of miners in the southwestern part of the State, much development work is being delayed. The work on the Cable and Shamrock mines and on the Potter tunnel has been stopped until the labor situation becomes easier. The cessation of work at many copper mines throughout the West ought to provide plenty of men for the precious-metal mines.

The low rate on low-grade ore, which the United States Reduction & Refining Co. inaugurated on October 15, is stimulating the output of Cripple Creek to a notable degree. The railroad officials cannot supply sufficient cars. Frequently 3,000 tons are shipped in a day. When the Golden Cycle mill is completed and ready to treat the ore, it is expected that a lower rate even than that now in vogue will be put in force. This will be in January. Under the present conditions, the Eagle Ore Co. of Victor has been forced to put on a night-shift to handle the increased tonnage sent to its plant for sampling.

Motion for a new trial has been filed in the United States Circuit Court by C. L. Blackman, A. E. Keables, W. B. Cameron, and others connected with the Lost Bullion Spanish Mines Co. These parties were convicted of fraud. In the indictments it was charged that no deposits containing valuable ore or any metal had been discovered on the property. The defendants now claim that since the trial they have mined 21.99 tons of ore from the property and have sold the same to the Chamberlain & Dillingham Ore Co. of Denver for \$387.55, less the sampling and treatment charges. The petition gives as evidence the names of the men who saw the ore sampled at the purchaser's plant. It is to be hoped that the defendants will be able to prove that the ore in question really came from the Lost Bullion Spanish mines. Judge Lewis will hear the motion on November 20. [The judge postponed a ruling until December 26.]

A few Colorado mining men are now preparing a petition to lay before Congress when it convenes on December 10. The petition asks that the annual assessment work on unpatented claims be suspended until the present financial crisis is passed. In 1893, owing to the stringent financial conditions prevailing at that time, Congress passed an act removing the necessity for completing the \$100 worth of work on each unpatented mining claim. An affidavit only was required from the holder stating that his intentions were good and that he would comply with the law in its usual form when the time limit expired. The next year, 1894, by a special act of Congress, the same law was continued in force another year. Again in 1897 a somewhat similar act was passed, applicable however only to those who had enlisted in military service and exempting those who owned mining claims or interests from all liabilities during their term of enlistment. The present crisis is not as bad as that of 1893. The position of the West is comparatively strong and this seems an attempt to take advantage of a relief measure when no real necessity exists.

After 15 years of idleness the Exchequer mine at Salida is being re-opened. The nearness of the smelter, good transportation facilities, and the premium allowed for the iron in the ore make it possible to prospect and develop this promising property. The Housel-Melvin Mining Co. is installing machinery on its property on the Craig placer near Steamboat Springs. The equipment consists of a 50-hp. automatic high speed engine,

two four-inch centrifugal pumps, and a 150 light dynamo. A dredge is to be put at work on the placer as soon as possible.

Wallace, Idaho.

Local Conditions Better.—Strike in the Rex.—Antimonial Gold Ore.—Big Output of the Bunker Hill.—The Lookout Group.—The Monarch Mine.—Litigation Over an Assessment.

The mining industry continues to progress all through this part of the country in spite of rumors of all sorts, absurd and otherwise, and the gloom that was felt for the past week or two is rapidly clearing away. The old story of *Coeur d'Alene* mines being reorganized at a big profit seems to have been repeated in the case of the Rex mine, 12 miles from Wallace, on the Northern Pacific railroad. An immense body of shipping galena ore has been uncovered in the lower workings. The strike was made 125 ft. below the upper adit, and when first encountered the ore was about two feet wide, but this has gradually enlarged to five or six feet. Assays of the ore show returns of from 62 to 67% lead, and as high as 51 oz. silver per ton. It is calculated that there is over \$250,000 worth of ore in reserve at present, and the extent of the orebody still remains undetermined. The mill, which will have a capacity of about 250 tons of ore daily, will be started immediately, employing 21 men, while 35 will be employed at the mine. Over \$1,000,000 worth of ore was shipped from this mine in 1887.

No less than 1,154 tons of lead-silver ore were passed through the Kellogg adit of the Bunker Hill & Sullivan mine at Wardner yesterday. This is the second greatest lead mine in the world and this output of ore comes within a few tons of breaking all previous local records. The mine has paid nearly \$10,000,000 in dividends. Some fine ore has been encountered on the property of the Clearwater Copper & Gold Co. in the Clearwater district. Samples brought to Wallace assay all the way from 14 to 33% copper, from 3 to 21 oz. silver, and from \$1 to \$1.80 in gold per ton. Over 200 tons of this ore has been taken from the No. 3 tunnel in 26 days. The ore is self-fluxing and there is some talk of erecting a smelter at the property.—The Gettysburg mine, near Mullan, has closed down and will not resume until the spring. Up to today the mine had been employing three shifts of men and an excellent showing had been made.—Work has been resumed on the Lookout group of claims in the Mullan district. The property has been closed down for about six months and it will be managed in future by D. C. Hessian. Over 860 ft. of work has already been done and at present operations will be confined to driving on the vein from the end of the 700-ft. tunnel toward the discovery shaft, where a splendid showing of galena ore and carbonates has been made. The drift will be continued to a point directly underneath the shaft, at which point a vertical depth of 400 ft. will be available. No assays have been made from the lower workings, but the surface ore assays from \$5 to \$40 per ton.—The lower adit on the Copper Queen property near Mullan has now cross-cut 16 ft. of the lode without disclosing any sign of the hanging wall, and the whole of the face is now in chalcopryite and peacock copper ore averaging as high as 20% copper. Much of this ore is clean enough to sort by hand and ship without concentration. The gangue is spathic iron. In the upper level the lode showed a width of 40 ft., and it is hoped that the new level will put the mine on a shipping basis, as the drift is over 100 ft. east of the body of solid ore disclosed by the winze from the upper tunnel.—Between 400,000 and 500,000 tons of free-milling gold ore is said to be exposed in the Monarch, just across the State line and situated at

DeBorgia, Mont. The mine has just been inspected by E. D. Sanders, of Spokane, with a view to a purchase. This property is equipped with a 5-stamp mill, sawmill, and all the other accessories.

Some excellent ore has been taken from the Ben Hur mine in the Saltese district. This was taken from an open-cut and not more than 12 ft. from the surface. It is chloride and the silver contents are high. The assay shows \$1.20 in gold, \$25.92 silver, and \$17.64 in copper. The ore is taken from the lode from which the Last Chance Co. of Wardner has shipped so much rich ore. About 10 inches of 30% lead ore has been encountered at about 225 ft. in the adit of the Phedora mine in this district. The ore has just been encountered and the body is improving with every shot.—Thomas Wall, one of stockholders in the Basin Mining Co. has brought action against the company to prevent the sale of 20,000 shares on which an assessment has not been paid. Wall claims



The Coeur d'Alene, Idaho.

that the company has refused many offers of 10c. per share for its treasury stock, but refuses to sell for less than 15, and, rather than accept the smaller price, levied an assessment for the purpose of continuing the development work. The company, on the other hand, claims that they are quite within their rights in making an assessment, and that every legal formality has been complied with. The case is an interesting one.

The Hecla Mining Co. at Burke has declared its 53rd dividend. This is at the rate of two cents per share and the total amount involved is \$20,000. For this year \$460,000 has been disbursed and a grand total of \$1,460,000 has been paid by the company.—An assessment of two mills per share has been levied on the capital stock of the Sonora Mining Co. E. O. Herring, of Wallace, has been appointed to fill the vacancy caused by the resignation of C. W. Gibbs, the secretary-treasurer of this company.—At a special meeting of the Hector Mining Co. options were taken on the Ontario claim and on one-half of the Lucky Boy lodes extending over a period of 18 months. The claims adjoin the company's property at Burke.

Butte, Montana.

Boston & Montana Operations.—The Orebodies in the Mountain View.—The Pennsylvania and Leonard.—Fighting the Fire Underground.—Systematic Plans.—British Butte Co.—A Supposed Rich Gravel Deposit.

Since production was decreased, the Boston & Montana Co. has employed 1,450 men, but 385 of them have been engaged in fighting the fire in the Leonard and West Colusa workings. The others are employed at the Mountain View, Pennsylvania, and East Colusa. The company has been shipping as high as 1,100 tons of ore per day, that is, 600 from the Mountain View, 400 from the Pennsylvania, and 100 from the East Colusa. The Mountain View is unquestionably the biggest copper mine in the Butte district. The veins—six in number and running from 8 to 50 ft. in width—have been developed to a depth of 1,400 ft., and some ore is coming from every level. The shaft is 2,200 ft. deep and has been connected at that depth with the 2,200 of the High Ore mine, of the Anacouda Co., for drainage. The Mountain View is capable of yielding almost any grade of ore, but the average of first and second class is about 5% copper. At the Pennsylvania, mining is confined to the workings above the 600-ft. level, on the old veins. Below the 600 the Butte Coalition Co. is interested in the orebodies, owning 38% and the Boston & Montana 62%, and when the Coalition practically shut-down, work in that portion of the Pennsylvania was stopped. The veins have been opened to the depth of 1,400 ft. there and some large and rich ore has been blocked out and was being mined when the order for suspension was given. The Leonard has also been worked to a depth of 1,400 ft. and the West Colusa to a depth of 1,800 ft. At the Leonard the company is installing an auxiliary pump, having a capacity of 400 gal. Since the fight with the fire began the water to be pumped out has about doubled, and it brings up some rich copper solution from which the copper is recovered by precipitation, and the company's precipitation business has consequently increased greatly. The East Colusa is being worked to a depth of 900 ft., and the Boston & Montana was about to start sinking to the 1,200 when all development work was ordered discontinued. A large new orebody was opened under the East Colusa shaft from the Leonard workings.

The Boston & Montana is making good headway with its fire-fighting work in the Leonard and West Colusa, and conditions in those mines are immensely improved. Within a month the Mitchell air-shaft, which is being sunk right over the fire on what is known as 'the neck,' near the corner of the Minnie Healey claim, will be completed, and all the gas and smoke from the fire will be forced up that shaft. It is now 800 ft. deep and will be sunk 900. That it is very near the fire has been proved by the intense heat encountered recently. When that shaft is completed the fire will be attacked from all sides. The company is sinking four shafts for the purpose of fighting the fire. The old Gambetta No. 1 shaft, 150 ft. east of the Mitchell, is being re-timbered and sunk deeper. It is now 300 ft. deep. Gambetta No. 2, about 150 ft. farther east, is 200 ft. deep. Farther east yet is the Minnie Healey shaft with a depth of 1,200 ft., to which 200 ft. were added by a raise made by the Boston & Montana from the Leonard workings. The Minnie Healey had served as a vent for the gas from the fire, but recently it caved all the way down and shut off the draft. The Boston & Montana is now engaged in re-opening and re-timbering that shaft. In addition to these four shafts the company has also obtained permission from the Butte Montana Co. to use the shaft of the Alex. Scott mine and is making connections from that shaft with the West Colusa work-

ings. Connections have already been made at the 700 and 900 levels, and work is now being done on the 1,000-ft. level. The Butte Montana Co. sunk its shaft 1,000 ft. deep, and the Boston & Montana has agreed to sink it 200 ft. deeper, and from the bottom the final connection with the West Colusa workings will be made by the Boston & Montana Co., which will give splendid ventilation to both properties and save the Butte Montana Co. a large expenditure for development work. In the opinion of J. C. Adams, general superintendent of the Boston & Montana Co., the fire in the mines will be under control in a short time now. Of course, the fire stopped all work in the Leonard, West Colusa, and Gambetta ground, and also put a temporary end to all development work that had been under way in those properties. It is fortunate that the enforced suspension came during the general copper depression.

The British Butte company, which is engaged in exploring placer ground west of Butte, has its shaft down 680 ft., and from the bottom of it the company has been boring with a Keystone drill to a depth of 850 ft., and some good gravel has been brought up, assays running as high as \$11 per cu. yd. Bedrock is not yet within reach. The water is so heavy that sinking is carried on with difficulty, although a large pump is in operation at the 680-ft. station. Samples of the stuff being brought up by the drill are taken every few feet, and the increase in value has been gradual. At a depth of 83 ft. the assay gave \$1.20 per ton per cu. yd., which increased to \$11 at a depth of 850 ft. All the samples show some gold. Some of the dirt recently brought up carried small nuggets of gold, and this accounts for the high assays. It is the intention of the company to cut another station at the 850 and to run some levels from that point and drift along the channel. It has been the object of the company to sink to bedrock, the theory of geologists being that the country west of Butte, upon which the British Butte claims are situated, was an old lake-bottom and that at bedrock great placer gold deposits would be found. Charles Olden, an English engineer, who represents the London men interested in the company, has endorsed that opinion and he expresses the belief that an immense area of pay-dirt will be opened. It has been demonstrated that the gold can be saved by means of the cyanide process, and an experimental mill has been built on the ground and is in charge of H. L. Whitaker, a metallurgist sent out from London.

Chihuahua, Mexico.

*The Parral District.—Veta Colorada Mines.—Shipments to Smelters.
—Mina Prieta.—The Famous Palmilla.—Operations at Santa
Barbara.—The Hinds Consolidated.—The Tecolotes Mill.*

There are two classes of ore in the Parral district, namely, the clean silicious ores which are now considered susceptible to cyanide treatment; and the heavy zinc-lead sulphides which will require concentration. The first of these carry silver as chloride, sulphide, and bromide. These ores will run about 84% silica, 2% iron, 1½% sulphur, and 18 to 24 oz. silver per ton. The mines of the Vita Colorada Mining & Smelting Co., near Parral, have extensive bodies of this highly silicious class of ore, and to extract their silver contents a cyanide plant is being erected under the supervision of Robert Allen. The line of the Parral & Durango railroad runs from Parral to Minas Nuevas station, the latter being situated near the Vita Colorada mines. Tests indicate that an 80% extraction can be made by cyanidation. The heavy sulphides of the Parral district are estimated to carry an average of 18 oz. silver, 10% lead, 15% zinc, and about 0.08 oz. gold per ton. These sulphides are found

at and below water-level, but this level occurs at a variable depth. While the output of the better grade ore is curtailed just now, ordinarily the shipments of Parral and Santa Barbara ores to the Torreon smelter run from 1,500 to 1,800 tons per month. The Torreon smelter is represented in the district by James W. Hambleton. The Monterrey Mining, Smelting & Refining Co., represented here by Adolf Beyer, has contracts that call for a large tonnage from the Parral district. The high-grade shipments from the Palmilla go to the Monterrey plant. It is claimed that ordinarily the shipments from this district to the Monterrey plant will run 2,500 tons per month, and this is largely silicious ore. The American Smelting & Refining Co. is represented at Parral by Ferguson Doak. This company handles the ore and concentrate of the Hinds Con. M. Co., the Minas Tecolotes, and Granadefia of Santa Barbara. The Mapimi smelter, situated some 35 miles north of Torreon, also obtains ore from the Parral-Santa Barbara district.

The Mina Prieta, belonging to the Prieta Consolidated Mining Co., is said to be the oldest mine in this district, excepting the Clarinos at Santa Barbara. The Prieta has a three-compartment shaft 400 ft. deep. Its hoist, air-compressor, and crusher are operated by electric power, as is also a locomotive used in hauling ore from the shaft to the railroad. The water-level is at 300 ft. depth and the ores above it were worked out long ago. Below this level, where present development is in progress, the ores are said to run 10% lead, 10% zinc, and 30 to 150 oz. silver per ton, with 2 to 4% copper. An adit is being driven from one of the upper streets of Parral to the shaft to be used as a drainage channel. This will reduce the lift required of the pumps about 175 ft. D. H. Bradley is manager of the property. The El Tajo mine, being managed by E. A. Swain, is on the same vein as the Prieta. About 1,000 tons per month is being mined.

The Perros Bravos mine, near Santa Barbara, is under lease to Butler & Cooper of Parral, who are mining and operating a jigging plant. They have been shipping concentrates since last March. Their ores are said to carry an average of 5 grams gold, 850 grams silver, 10% lead, and 6½% copper. The gangue runs about 50% silica, 8% iron, 6% zinc, and 7% lime.

The Palmilla mine, situated four miles from Parral, whose production since 1900 brought great wealth to Pedro Alvarado, is now under a 15-year lease to J. A. Coram and associates and is under the general management of F. C. Morehouse. An aerial tramway connects the mine with the ore-bins on the railroad. The main working shaft is down to a depth of 575 ft. on the principal vein of the group. The bottom of the shaft is at water-level, and the lowest workings form a sump in which a quantity of water has accumulated. There is a pump station on the 500-ft. level and one at the 550, electrically driven pumps being installed at each of these. A drainage adit is being driven from the side of the hill to cut into the shaft at a point 250 ft. below the collar, thus making it necessary to pump water up to that level only. Two new air-compressors are being installed, to be electrically driven. Underground the workings expose great chambers, showing the orebodies to have been 100 to 200 ft. wide. The ore is silicious, carrying sulphide of silver, chlorides, and native silver. At water-level the ore becomes more of a sulphide, and the lessees intend to sink deep into this sulphide body, the showing at the bottom of the workings indicating that the width of ore is just as great below present workings as it was in the worked-out chambers above. Pumping facilities are now ample for keeping the water out of the way. A. L. Dickerman, consulting engineer of the property, is at the mine.

The Hinds Consolidated Mining Co. is developing and mining a group of five properties, situated three miles north of Santa Barbara. These include the Remedios, Reforma, Santa Gertrudis, Clarines, and Pilaes, all of which are on one and the same mineral vein, whose outcrop is traced 7,000 ft. The vein will average 10 ft. in width, as demonstrated by the large amount of work performed, and strikes north-south through a shale country. The gangue is a quartz carrying lead and silver, associated with which are gold and copper. In some parts a little zinc occurs, but in the concentrating process to be adopted a sufficient part of the zinc can be eliminated to obviate any penalty at the smelters. In the Clarines there are some lead and copper carbonates. The mines are opened by both shafts and adits, the latter being on the vein. The greatest depth is 350 ft., in the Remedios. A concentrating mill of 200 tons capacity is

driven 1,900 ft. on the strike of the main vein, with branches running from it on the two secondary veins. This level is equipped with electric haulage. Other levels open the same veins above this one, and near the portal of the main level a shaft goes down 300 ft., from which drifts have been extended into the ore. There is a vertical distance of 800 ft. between the highest and lowest workings. These veins stand nearly vertically between slate walls. The ore is complex, being a sulphide, carrying gold, silver, lead, zinc, and copper. A visit to one of the stopes showed a vein of solid ore 10 to 15 ft. wide. It is said 150,000 tons of ore are broken in the mine at present. The mill of the Tecolotes is near the town of Santa Barbara. It makes an output of 600 tons per day. The mill treatment includes crushing, classifying, and concentration by jigs, tables, and vanners. The 28 sets of jigs make a pro-



Map of Mexico.

being erected, which is expected to be in operation in January next. This is to be the first of two units, the second to be erected at a later date. The new mill provides for coarse concentrating with jigs, classifiers, and tables. The power is to be steam, with wood as fuel. High-grade ore and hand-jig concentrate, amounting to one car per day, are being shipped. There are 20 hand-jigs in use here, producing a high-grade concentrate. A railroad branch, over three miles in length, has been completed from the Mexican Central tracks up to the millsite, and material is being hauled by a new locomotive. Wm. Wells Elmer is general manager for the company, the president, Howell Hinds, having other mining interests in various parts of Mexico and the United States.

The Minas Tecolotes at Santa Barbara belongs to the American Smelter Securities Co. of New York. At this property A. B. Emery is general manager; W. M. Drury mill superintendent, with E. E. McIntire as mine superintendent. The mine has one principal vein, with two feeders coming into it at an acute angle. A level has been

duct of five sizes. The jig tailing is reground in Huntington mills; part of the jig-tailing, however, is reground in rolls.

The reground material passes through Richards' classifiers, the first size going to jigs and the second to Wilfley tables. The overflow from the classifiers passes to the vanners, as does also the thickened pulp. The jigs make a product that is largely lead; the Wilfley tables make a lead-iron product, also a zinc middling; to treat the latter a new plant is being built, in which magnetic separators are to be installed. The silver and gold are associated with the lead and iron in the table and vanner products. There is a large accumulation of zinc middling here to treat which the new zinc plant is being erected. A gas-producer supplies a wood and coal gas to operate seven American-Crossley gas-engines, the latter in turn operating seven electric generators. Two of the latter are direct connected to two Nordberg air-compressors. The other generators drive motors throughout the mill and shops. A steam railroad is operated to haul ore from the mine to the mill.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

ON several New Zealand dredges shaking screens have been installed in place of revolving trommels.

SORTING at the Rand mines varies considerably in amount; at the Princess Estate mine 37% of the mine-run rock is sorted out, while at the Consolidated Langlaagte mine no sorting is done.

ONE machine sharpener at the Homestake mine, South Dakota, is sharpening steel for 100 drills with less waste of steel and about one-tenth the number of broken bits to trim as there were when hand sharpening was employed.

THE Adair-Usher cyanide process is rapidly increasing in favor on the Rand. It is already in use at the Crown Reef, Ferreira, Geldenhuis Deep, and May Consolidated properties and is being installed at the New Princess, Ginsberg, and Treasury mines.

THE WORKING COSTS per ton at the Great Boulder Perseverance mine, in the East Coolgardie district, West Australia, are as follows: Ore breaking, \$1.63; sulphide treatment, \$3.07; general expense, \$0.27; tailing distribution, \$0.12; total cost, \$5.09.

THE COST OF CYANIDATION at the Progress mine, Reef-ton, New Zealand, was 39c. per ton, made up as follows: Wages, per ton, 10c.; cyanide, 21c.; zinc and chemicals, 4c.; general stores, 1c.; assaying, 3c. The Progress mill contains 65 stamps; 38,410 tons, 68.4% of the tonnage crushed was cyanided.

DEVELOPMENT WORK in wet mines should be kept at least one level ahead of stoping. This policy keeps the stopes in a better drained condition than when, in a wet mine, ore is stoped from the deepest level. All water should be caught in drains, as soon as it can be, and should not be allowed to seep down through the stopes. Especially is this true in copper mines.

IN CYANIDING ANTIMONIAL GOLD ORES sodium cyanide seems to be more economical and more efficient than potassium cyanide; at least that is the case at the Keep-it-Dark mine, Reefton, New Zealand, where the use of sodium in place of potassium cyanide has decreased the cost of cyanidation 12 cents per ton. The total cost per ton for cyanidation at this property is 66 cents.

THE working costs at Rhodesian mines, as taken from the reports of companies whose combined output amounts to 752,478 tons (over half the output of Rhodesia) are as follows: Stoping, crushing, transporting, sorting, etc., \$1.75 per ton; milling, 95c.; general expenses, 65c.; cyaniding (177,846 tons), 33c.; total working expense, exclusive of redemption, \$3.68 per ton. On producing mines, the number of white men employed per stamp averages 1.17 and the number of natives averages 17.33.

AS TO METAL-PRESERVERS, several kinds of paint have been used with varying success, but the best results have been attained with the use of red lead mixed with linseed oil. The steel should be thoroughly cleaned and one or two coats of this paint applied. Care must be taken to rub the first coat firmly and uniformly on to the metal when it is dry, leaving no pores unfilled, as the perspira-

tion of the metal will work out on such places and rust will appear. After having established a good base of red lead paint, two coats of any good paint can be applied.

DRILL-SHARPENING BY HAND at the Homestake mine, South Dakota, costs over twice as much as machine sharpening. To sharpen 1,000 drills it takes 10 blacksmiths at \$3.50 and 10 helpers at \$3, amounting to \$65, and it requires 1,200 lb. of black coal, costing \$7.20, making a total cost of \$72.20. The cost of sharpening 1,000 drills by machine is as follows: One machine, air to run same, \$2; 2 blacksmiths at \$3.50, 2 helpers at \$3, \$13; 2 blacksmiths sharpening block-hole steel, \$7; 2 extra tool packers, \$6; 720 lb. coke, \$4.75; fire-brick to repair furnace, \$0.20; total, \$32.95.

THE cost of shaft-sinking on the Rand, when machines are used, is \$2.80 per ton of rock broken; when hand-drilling is used, the cost is only \$2.30 per ton. In driving drifts hand-drilling is also cheaper, but in stoping, when machine-drilling is used, the cost is about 30c. per ton cheaper than when hand-drilling is used. On the Rand 88% of the development work is done with machines, owing to the greater speed obtained, while only 47.8% of the ore mined in the stopes is drilled with machines. This is due to the decrease in the grade of ore hoisted, when machines are used in narrow stopes.

CROSS-HEADS should always be used when hoisting is done by means of buckets. In sinking a shaft, many favor the use of a bucket instead of a skip. The sinking-skip with its long runners is far from ideal but, in large and deep shafts, hoisting with skips is not only safer but somewhat more economical than hoisting with buckets. When sinking a shaft in which hoisting is being done, a bar of ground 10 ft. thick at the bottom station is far safer than the more commonly used wooden bulk-head. Through this bar only the hoisting compartment is cut. Buckets, of course, are used in sinking from an underground level; a cross-head should always be used in such work.

HELMETS for fighting underground fires should be always provided at large mines. At Butte, Mont., such is generally the case. Coal mines almost always are so equipped, but metal mines are generally considered immune from underground fires. But that is far from the case, especially at mines whose ore carries a heavy percentage of sulphur. The recent experience at Bisbee, where the sudden breaking out of a fire in an abandoned stope threatened to restrict the work in several of the large properties, is a case in point. Fire-fighting equipment for underground use is seldom needed, but when required it is wanted badly. Ability to safely build bulkheads near the fire frequently is very valuable. A good helmet makes that possible.

MANY copper mines in the United States have greatly decreased their force of miners; consequently in many districts of the West there is an over-abundance of miners—quite a contrast to conditions last summer. Already many mining men have noticed the increase in the amount of work which miners think constitutes a shift's work now that many miners are 'rustling' for jobs. We hope that this will emphasize the fact that any man does more work when he knows there is another man anxious for his job. But financial depression is not necessary to produce this condition. By properly ventilating the stopes, by furnishing the miners with plenty of good tools, by providing good bunk-houses at mines away from towns, and in many other ways, it is possible to accomplish this even in prosperous times.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

Cyanidation in Nevada.

The Editor:

Sir—Although a great deal has been written regarding the mines of Goldfield and the surrounding districts, comparatively little has appeared in print regarding the treatment of the ores produced by these mines. The article by A. R. Parsons (in your issue of October 19) is a notable exception.

In looking over the list of mills operating in these districts, it is interesting to note that the predominating scheme of treatment is wet crushing and cyaniding; amalgamation, concentration, and re-grinding forming details of the general plan of treatment. The idea seems to prevail that this is the only process suitable for these ores. Engineers know how difficult it is to introduce a new process into a district where certain methods have come to be recognized as standard, even though the proposed process has been highly successful elsewhere. Having this in mind, and desiring to overcome these objections, I propose a discussion on the subject of the best method of treating the sulphide and sulpho-telluride ores of Goldfield. The ores of Tonopah differ from those of Goldfield in one important particular—the presence of silver—and it would probably be best not to consider these, at least for the present.

By "best" method is meant that one which yields the greatest ultimate profit. The following is a provisional description of the Goldfield ore: The ore is a hard white quartz averaging about 85% silica, 7% pyrite, and about 8% lime, magnesia, and alumina, the latter being derived from the wall-rocks. The ore carries about 3 oz. gold and no silver. The gold is in a fine state of division and does not readily plate. The sulphides are very fine and uniformly disseminated through the rock. The assay-value of the sulphides runs from \$400 up. Tellurides of gold are frequently present.

For this ore I propose the following scheme of treatment: Preliminary crushing in breakers and roughing rolls and fine crushing to 25 or 30 mesh in ball-mills after drying. Oxidizing roasting in Edwards furnaces and final leaching with cyanide solution. The details might have to be changed so as to include re-grinding and amalgamation after roasting, in which case separate treatment must be provided for the sand and slime. I have not attempted to go into the details of the above plan as they can be best brought out later on.

I would suggest that the process now in operation be designated as the Nevada Wet Process and the proposed one as the Nevada Roasting Process. There is nothing so original in either as to warrant such distinctive names, but it is convenient for the purposes of discussion.

R. STUART BROWNE.

San Francisco, November 18.

A Sampler.

The Editor:

Sir—Referring to your issue of November 9, I would advise Mr. Knight, who is having trouble with his sand-sampling augers, to try one made as follows: Take an ordinary thin brass vanner roller, saw off each end, thus making a hollow tube. Take a piece of half-inch pipe, put on one end a bushing of a diameter slightly less than the inside of the tube, fasten a piece of wood about five inches long to the larger end of the bushing; the whole becomes a ramrod to work easily in the tube. To use it,

place one end of the tube with the ramrod in the sand, place the other end under the arm-pit and press down as convenient, withdraw, and ram out the charge; place the tube back in the hole and repeat the performance until bottom is reached. For very wet slimy material, the rod should be rammed up and down once or twice to produce a suction effect. This method of sampling requires a little longer time than with the auger, but it gives a perfect core. Samples from different depths of charge can easily be obtained.

H. W. MACFARREN.

Blair, Nevada, November 17.

Professional Customs.

[The questions to which reference is made in these letters will be found in our issues of October 5 and 12.—Editor.]

The Editor:

Sir—I have read with mixed feelings the letters appearing in your discussion columns under the head of 'Professional Customs,' dealing with certain questions from the point of view of professional ethics.

I deprecate the attitude maintained, and the more so as some exponents have seemed to deal with the matter with, perhaps, insufficient thought. To whose benefit, I would ask, does such a discussion redound? Do we need to be told that the profession demands all that is of common sense, all that is of honesty, even to the sacrifice of individual interests, or, in the mind of the original questioner, did there lurk the idea that certain perquisites were permissible, certain latitudes to be demanded, and the sooner the general public was made aware of the privileges of a mining engineer, the better? Shall we form a union to have these points the better understood, or shall we not rather accept the watchword recently given us, "Whatsoever things are just, whatsoever things are of good report, think on these things."

I am not making an original remark, but, in my opinion, repeating a very true one when I say that a mining engineer, young or otherwise, who needs to have his conscience or his judgment upheld by 'customs' is hardly likely to appreciate the high aims that the profession demands.

N.

Nelson, B. C., November 9.

The Editor:

Sir—It appears to me that the questions may be separated into two groups; first, those of business methods, concerning which a decision can be reached by considering which course will give the most satisfaction to all concerned, consistent with thorough and honest work; second, those of business ethics in which the moral faculties should be exercised. Judgment concerning the first would vary with experience and would be based upon the nature of the work and the disposition of the client, but there should be unanimity of opinion upon those of the second group. I should say that questions, 1, 2, 3, 4, 5 (except 'c'), 6, and 9 are questions of business judgment; the remaining, 5c, 7, 8, and 10 are ethical in nature.

1. In the business of examining mines, an engineer comes into contact with two classes of people; those acquainted with the nature of the business, and those more or less ignorant of it. It has been my experience that those clients unacquainted with the business, prefer to have the work done for a fee. It is almost always possible to arrive at a fairly close estimate of the amount of time required for the work, and the fee may be based upon this. Those familiar with the business generally prefer to engage an engineer upon a time-basis.

2. In general, it is well to ask the client to acknowl-

edge receipt of a letter containing the basis of contract. No serious client will object to this.

3. A sum sufficient to cover expenses may be asked in advance.

4. An examining engineer is supposed to have a complete equipment at his disposal, including instruments, etc., as well as clothes for most climates and conditions. Any unique equipment should be supplied by the client.

5a. Personal expenses, such as laundry bills, tobacco, and ordinary medicines, should be borne by the engineer. A tip is given in appreciation of a service, and, where this service is personal, it should be paid by the engineer; when performed in the interest of the client, by him.

b. Few clients would respect an engineer who chose to travel second class.

c. This is a question in ethics. It is no more right to charge for something not received in this case, than to charge for ten days time, when the work required only a week by working in the evenings.

d. Keep the expense account to satisfy the client. To be sure, keep a detailed account of all expenses.

e. Take vouchers for everything not connected with traveling expenses.

f. Yes.

g. It is generally satisfactory to all concerned, to submit an expense account at the end of the work.

6. In general, make no report except upon positive final judgment.

7. This is a question in ethics. The information gained in examination work belongs strictly to the client, and an engineer doing examination work solely, or largely, should leave the stock market alone. The lack of thought on this subject has wrecked the careers of too many engineers, both in personal happiness and in professional success.

8. It is legitimate and advisable to see as much of a district as possible, but not to use the information for personal gain, unless with the consent of the client after a thorough understanding of the situation.

9. A client will seldom object to this, provided the facts given have a scientific rather than a practical interest, though consent should be obtained in every instance. Under most conditions a free interchange of opinion on the scientific phases of mining engineering is to the best interest of everyone.

10. If an engineer's opinion may be expressed in one word, "No" or "Yes," he should, by all means, so express it. Failure to do so, where desired, generally indicates the lack of positive conviction. Some classes of work, such as consultation with reference to development, do not permit such definite answers, and the opinion must be qualified.

It is my opinion that a habit of forming definite ideas and therefore, of reaching definite conclusions, though it cannot always be done, is worth cultivating. I have noticed that many engineers, living in a camp, grow accustomed to seeing prospects on every hillside, and become careless in examining them. If it were kept in mind that no prospect should be passed without making some definite observation, or observations, if possible, we would soon come to recognize associations the lack of knowledge concerning which largely explains the primitive condition of the science of ore deposition, compared to other branches of applied science.

In general, with reference to the questions of business judgment, it can be said: Satisfy your client in every way, consistent with thorough and honest work. As to those of an ethical nature, satisfy yourself, but study carefully your own moral decisions.

FOSTER HEWETT.

Pittsburg, November 12.

The Editor :

Sir—Discussion of the questions of T. S. in your issue of October 5 raises the whole question of the relations between examining engineer and client. Necessarily the conditions and the personalities must alter and govern each case, and no hard and fast rule can be laid down. Our profession is not like that of medicine, and a strict code of ethics does not govern us, nor is there an established or even customary rate of charges for specific services. The young engineer of mines is without protection in the way of a union or association, and therefore must hustle for himself and accept many a knock.

I shall group questions 1, 2, and 3. It is usually better to charge a *per diem* rate, but in a case where the trip may occupy several months, a monthly rate could be substituted. In the case of a short trip, say, covering a few days only, where the *per diem* rate would be insignificant and hardly commensurate with the responsibilities undertaken by a reputable engineer in a signed report, it would be better to charge a lump sum and expenses. An advance of cash to cover expenses is usual and proper, as is also the exchange of letters covering the question of the consideration, etc. Often an engineer is requested by wire to make a trip and naturally he must choose to accept such engagement as sufficient and put up his own expenses or decline the service. I have known engineers to send their reports to clients with bill attached C. O. D. by express. Also I know by experience that sometimes a report is simply ignored and never paid for, possibly because it is unfavorable or because of money stringency. The engineer does not like to sue for collection of such an account and in such a case he loses his time and often his expenses as well.

No. 4. Equipment consumed in the work, such as ore-sacks, etc., is of course chargeable; the engineer's tools should belong to him.

No. 5. Traveling expenses include all tips, as these are part of the hotel bills. Drinks, tobacco, ammunition, etc., I should say, were not chargeable. Travel first-class always. The people met on trains and steamers are a valuable source of information to the engineer. To go second-class and charge for first is not right. Keep close account of expenses and pocket any loss arising from a lapse in this line rather than introduce a large incidental list. It looks careless, and that is a grave mistake for an engineer. Make your returns at the end of the trip with your report, unless by previous arrangement.

No. 6. Make your report when the examination is completed, unless preliminary statements are requested. In making such, be careful that they do not mislead; a first impression often is a wrong one, and I have a case in mind where such a preliminary report was cabled to London and was favorable, whereas the final findings were the reverse; the result, naturally, was injurious to the engineer's reputation.

No. 7 and 8. These open up the whole field of the business of engineering. The engineer making an examination of a property should give no intimation of his findings to others than his employers and to purchase the shares of the company would be advertising his favorable opinion, by inference, at least. Also it would be held as having an influence upon his findings of fact and thus detract from the value of the report. If the engineer is in the permanent employ of a company, the matter is different. It is well known, or, I might better say, "well believed" (as our knowledge of the matter is nil), that many of the greatest lights of the mining profession made their large fortunes through speculation in shares of their own and adjoining companies. It is a further fact, and an unfortunate one, perhaps, that the business world

gauges their eminence as engineers by the light of their affluence, pays them immense fees and retainers, and considers their judgment as incontestible. The engineer deals with business men whose code of ethics is an elastic one, they demand results and they take no umbrage at the endeavor of even a poor engineer to acquire a competency. I believe it is permissible and entirely honest for the engineer to purchase stock in the properties he has examined; but he should do this with the knowledge and consent of the officials or of the parties employing him. What better endorsement should a business man want than the fact that his engineer desired to become a stockholder? Of course, I am not thinking of the common promoter who wants a report only as a kite to raise his worthless stock, and such participation by the engineer is, of course, to be deplored.

The question might be reversed by asking whether an engineer should be barred from buying a good stock because his examination and personal knowledge shows it to be good? This would place him in the position of being forced to buy stock only in something about which he knows nothing.

No. 8. If an engineer's examination shows him that the property adjoining is of considerable value, this information belongs in the report first. If the employer does not desire the additional property, after receiving the advice to acquire it, it would be folly to expect the engineer to allow the opportunity to pass, and be grasped by others; regardless of the fact that his information was gained while employed in making said report. Common horse sense and honesty will govern the engineer and in the long run carry him through all right.

No. 9. After the report is delivered and with the employer's consent, a general description may be published and would often be of value to the profession.

No. 10. Say "Yes" and "No," or say "I don't know." That's what an engineer is hired for, and he is entitled to say the last when the conditions are such as to leave the matter obscure. It is no crime to say "I don't know." Naturally the conditions must be minutely described to justify these three words, and among these conditions are workings inaccessible through caving, filling, or water. Expenses for the opening of such are only justified after consulting employers, as they should usually be borne by the owner of the property.

JAS. W. NEILL.

On the train, November 5.

Assessment Work.

The Editor:

Sir—Behold, the peripatetic locator of mining claims is to the fore again. He has located many claims, which he ought not to have done, and he has left undone the work of assessment which he ought to have done, and now at the thought that he may have to do that work himself, there is no health in him! His little flim-flam game is done, for the nonce, for pockets are out, and he is up against the ignoble necessity of working for himself unless Uncle Sam will let him off. *Ilinc ille lacrimae!* But Peripatetic was the same yesterday that he is today, and he will remain the same forever. At Nome, in the first few years after the discoveries were made, his locations covered miles and miles up and down the river and its tributaries, in fact all the available mining ground. And he did his hard work in the saloons, in the gambling halls, and in the dives. If a *bona fide* prospector chanced to find something good in his preserves, he at once pounced upon him. Failing to persuade him to disgorge, the gang drove him off, for, like wolves, all of that ilk band together in pursuit of the common game—the luckless wight who delves and discovers. The scene,

only, is changed; now it is Goldfield and thereabouts; but the Peripatetics are the same in type as those who held the golden sands of Nome under tribute in the latter part of the last and the early years of this century.

Neither in Nevada, nor in California, nor elsewhere is the honest miner seeking any relief from the obligation imposed upon him by law to keep his location good. He has done his annual work, or is doing it, and is too busy in his mine to spare the time to write a protest against the misrepresentation that is being practiced against him; therefore, I speak for him to expose the imposture that is being thrust forward in his name. There is not the slightest *vraisemblance!* The woe-begone hand-wringing figure that is being pushed to the front is not honest, nor is he a miner; he is a mere locator, a claim grabber of whom to beware! he is a promoter of the flotsam and jetsam type peculiar to all new mining regions! he is a speculator in mining claims, whose holdings are in groups and are rated by the quarter section or more, and he never swung a pick or handled a shovel in his life.

EDWARD A. BELCHER.

San Francisco, November 25.

The Editor:

Sir—As an admirer of the usually sound arguments found in your bright and entertaining columns in furtherance of the interests of mining, I believe it could not have been your mind or heart that was responsible for the editorial conclusions in your issue November 16, concerning the desirability or otherwise of the proposed petition to Congress to omit the annual assessment requirements on mining claims for the year 1907.

As secretary of a Montana mining company, recently successfully financed, and after 16 years residence in the mining regions of the Northwest, I am acquainted with hundreds of mining men and prospectors throughout Washington, Idaho, and Montana, 95% of whom are men of earnest intentions and as honest at least as an average body of men elsewhere. It is a fact that the recent financial flurry has worked temporary inconvenience in every conceivable way to the mining industry and to every individual connected therewith. Among the reasons alleged against the proposed legislation your article states that "the real miner and prospector has done his work by this time, and if not, the financial stringency will not deter him, for his credit is unimpaired." Speaking for thousands of miners and prospectors in the Northwest alone, owning claims, but as yet without capital, and who depend upon their season's savings at other employment (be it with the big mining companies or in the harvest field) to do their annual assessment work in the fall, it is customary to witness the greatest activity in this line of work during the last three months of each year.

This year these useful citizens, from no fault of their own, find their savings temporarily tied up in the banks. Much of their individual credit at the stores is useless, for the reason that the stores in turn have been obliged to retain their wares on the shelves excepting for cash; thus making it doubly difficult or impossible to obtain "powder and grub" and other mining supplies necessary.

The Scripture tells us that "The rain falleth upon the just and upon the unjust." Does it cost us anything either while extending relief in other directions, to render a little timely aid to the mining industry as a whole?

MARK E. DAVIS.

Oakland, November 12.

[We do not agree with the tone of either of the foregoing letters, but we are willing to let others have their say. The writers are, respectively, a lawyer and a promoter; we shall be glad to hear from the prospector himself.—EDITOR.]

The Prospector and His Friends.

The accompanying photographs we owe to the courtesy of Mr. John Daggett, Lieutenant-Governor of Cali-

ornia on his way to Graham Gulch. He did not have a cent, trundling his wheelbarrow for 40 miles from Aetna to Grand Gulch. There he struck a pocket from which he got \$6,000 worth of gold, and thinking that he had ex-



Fig. 1. Ace High.



Fig. 2. A Full Hand.

fornia from 1882 to 1886 and superintendent of the mint in San Francisco from 1892 to 1896. The photographs represent various types of prospectors. The Governor has labeled them with an eye to terms that are used in

bausted it, he sold his claim for \$148 to some half-breed Indians, who have taken out \$30,000 since then. On his return from the diggings, Zalinsky slept in the day time and traveled by night, being in fear of losing his money, which he deposited in a San Francisco bank before returning to work. In 'One Pair' the prospector is better equipped than the wheelbarrow man or the single pros-

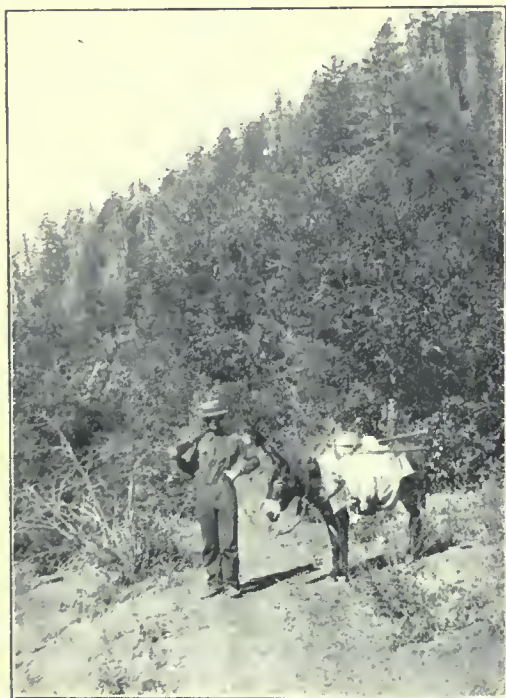


Fig. 3. One Pair.



Fig. 4. Two Pairs. 'Jacks and.'

a certain well-known game. For instance, the first is called 'Ace High,' and represents a surveyor named O. J. Milton on his way up Black Bear creek in Siskiyou county. It will be noted that he is carrying a complete outfit including a frying pan and blanket, a gold pan, pick, and shovel; other cooking utensils and grub are enclosed within the blanket. The picture labeled 'A Full Hand' represents a Pole named A. M. Zalinsky, who is

pector, for he has his faithful burro with him to carry his tools and utensils. In the illustration labeled 'Two Pairs' there appear a couple of prospectors accompanied by two jacks or doukeys. The men are Germans of some experience. They are carrying rifles and the photograph shows how heavily burros can be loaded. In 'Threes' there is a picture of an old prospector named Dunlap on his way to New River in the roughest part of Trinity

range. Note the characteristic attitude of the prospector, who is a good specimen of the kind of man that has always lived out of doors. Mr. Dunlap came to California with Gen. John Bidwell, and at the age of 73 he is still exploring in the mountains. His valise is on the front horse and his coffee pot on the other animal. He is evidently well 'fixed.' 'Fours' shows more burros, in

Decisions Relating to Mining.

Specially reported for the MINING AND SCIENTIFIC PRESS.

It was held negligence in a mining company to permit the taps or nuts on the bolts on the switch in the track to become loose, and the threads on the bolts to become so worn that they would not hold or retain the nuts so as to hold the switch in a secure and reasonably safe condition; and to permit the latch that held the rails of the switch in a proper position to become so loose that it would not remain in proper position, but permitted the points of the rails to become so separated that the motor and cars passing into the mine would split and mount the rails and one car thereby became derailed, and ran against and upon the minor employee whose duty it was to set the switch and to direct the cars on the different tracks entering the mine.

Western Coal Co. v. Burns, (Ark.) 104 Southwestern, 535, July, '07.

It is the duty of the owner or operator of mines to use proper care in placing and setting timbers to support the roof of the mine and to keep them in proper condition. This duty extends also to keeping the roof over the entries and to the roof over the necks of the rooms safe and secure as well as the roof of the mine itself. And for this purpose it is the further duty of such mine owner or operator to provide a competent

mining boss to inspect the walls and roof of the mine and such supports and to see that they are not only properly set but to exercise a continued inspection and that they



Fig. 5. Threes.

this case not heavily loaded but in splendid condition. The photograph is a snap-shot taken as they passed. Taken together these snap-shots of Gov. Daggett illustrate the type of men to whom the West owes so much of its development.

PEAT.—The production of peat-fuel has long been an alluring field. For a variety of reasons most of the numerous disconnected attempts at the utilization of such deposits have largely resulted in practical failure. There seems at present more hope of economically using this embryonic coal in certain districts, but the limitations need to be carefully remembered. The former projects for the production of peat-fuel were to produce a fuel of properties equal and even superior to coal and at a cost slightly more than nominal; these schemes, of course, failed. But the presence of considerable deposits of peat in localities at a sufficient distance from coal-fields seems to offer considerable chance for development by persons able, through training, experience, or study, to cope with the problems involved. There are a very few instances where a fairly good fuel has been produced to sell, with a fair profit to the makers, at roughly \$5 per ton, in localities where anthracite coal brought from \$7 to \$12, and bituminous from \$4 to \$6 per ton, and in localities where hydro-electric power was not available in small amounts at less than \$30 or \$10 per hp. year of 24-hour power. In such few cases the local demand has been stated to tax the capacity of the plants. In all similar situations success may be reasonably expected with proper care in the operation of the peat-plant. The fuel must naturally be made close to the bogs and cannot economically be shipped to a great radius to compete with coals.



Fig. 6. Fours.

are kept sufficiently to render the premises safe.

Brunson v. Southwestern Co., (Ind. Ter.) 104 Southwestern, 593, Sept., '07.

The sale on execution of the mining property owned by the lessor deprived him of all right to royalty under a joint lease made by himself and the owners of other mines where the royalties from all the mines were placed in hotchpot.

Coolbaugh v. Lehigh Coal Co., (Pa.) 67 Atl. 615, May, '07.

History of Cyanidation.—II.

By PHILIP ARGALL.

*It is quite clear that the decisions of the courts have on the whole been unfavorable to the MacArthur-Forrest patents, and by these decisions the claim of the patentees to be considered the sole inventors of the cyanide process is set aside. Furthermore, if we rely on the almost unanimous verdict of the courts we must admit that the cyanide process is a distinctly American invention, and, as I do not know any higher authority, I award the palm of discovery to the inventive genius of Rae and Simpson. No man, however, can deny that MacArthur and Forrest introduced the first cyanide process that commanded universal attention, that they evolved order out of chaos, achieved a brilliant success where others had failed, and finally gave to the world in the process that bears their names one of the most marvelous, though simple, methods of ore treatment that the human mind ever conceived. For this, their names shall be emblazoned high on the banner of metallurgical fame, to be both remembered and honored long after the strife of patent litigation is forgotten and the doctrine of "selective action" shall have passed "as a vision of the night."

The MacArthur-Forrest process then consists of neutralizing the acidity in a given ore with an alkali,²¹ dissolving the precious metals with dilute solution of potassium cyanide,¹⁵ and precipitating the gold on filiform zinc.¹⁶ The modifications of this process are numerous. I shall mention a few to illustrate the more important lines of departure: The patent of J. C. Montgomery of Scotland, July, 1892,²² employing sodium or potassium dioxide as an oxidizing agent in conjunction with caustic soda. The points provided for here were the furnishing of more oxygen and having a strong alkaline solution, as such solutions are more active than plain cyanide and water. The Kendall process²³ of 1892 for quickening the action of cyanide by means of ferro-cyanide of potassium; here it would appear that an attempt is made to hasten the action of the cyanide as well as at the same time conserve its strength; the evolution of nascent cyanogen is probably also introduced for the first time as a feature of the process, imitating, no doubt, the evolution of nascent chlorine in another process, which is well known to greatly augment the dissolution of gold.

Ahnarin B. Paul appears to have originated wet crushing with cyanide solution in the batteries at the Calumet mill, Shasta county, California.²⁴ In 1891 he asks:

"Why not crush your ore in solution, when you introduce solution after crushing dry? The loss of cyanide by crushing with it is but nominal, and is greatly overcome by the cheapness of working and completeness of cyanide distribution through the pulp in the tanks. This plan is so satisfactory to me that I am done with dry mills for the future."

Wet crushing with cyanide solution in the batteries was a distinct step in advance, but slime-treatment apparatus was not in a sufficiently advanced state to meet the requirements of wet crushing in solution, and so it did not take immediate root in this country. We next hear (in 1896) of wet crushing in solution in New Zealand,²⁵ and later it became the established practice in the Black Hills of South Dakota, from whence it spread over the mining districts of the West. Crushing in the cyanide solution in connection with amalgamation was practiced by me on concentrate obtained from roasted sulpho-

telluride ores in 1897. Crushing in cyanide solution is, I believe, the process of the future, on either raw or roasted ore, and with modern slime-agitation and filtering machinery, leaves little to be desired. In fact, the great advance in fine-crushing appliances during the last few years, coupled with the slime-treatment machinery above referred to, has well nigh rendered the treatment of sand obsolete. It is true that it costs more to grind a given ore to pass a screen of 0.006-in. aperture than to pass 0.02-in. aperture, but the increased extraction usually resulting from the finer comminution of the ore very materially exceeds the cost of grinding, to say nothing of the saving in time and equipment, for at best vats in this cold winter climate are a very expensive installation, particularly when the housing of the vats and the heating of the building is taken into consideration.

The Gaze process²⁶ of 1892, where the use of chloride, bromide, and iodide of cyanogen was introduced as improved gold solvents in connection with potassic cyanide. Gaze found that these halogen salts of cyanogen gave a wonderful stimulus to ordinary cyanide solutions, but he failed to obtain a patent, on account, it is said, of the opposition of the MacArthur-Forrest Co. in New Zealand. Later, Sulman and Teed obtained English and American patents covering the use of bromo-cyanogen²⁷. It cannot, however, be said to have come into general use except, perhaps, in West Australia, where bromo-cyanogen is used in the Diehl process, in the extraction of gold from unroasted or raw sulpho-telluride ores, but even there the cost of that chemical is often fully as much as the cost of roasting and never as effective, so in the end the roasting process is bound to prevail, as predicted by me in 1903.²⁸

Many other oxidizing agents have been patented; indeed I believe I am quite safe in stating that the whole list of oxidizers, or oxygen-furnishing substances, have been covered in one way or another in the patents of would-be inventors, not excepting hydrogen peroxide, which, as is well known, destroys cyanide, and is perhaps the best antidote in cases of cyanide poisoning. Of these various oxidizers but few have been found to have any practical use in the every-day working of the cyanide process.

A substantial improvement in the process of cyaniding was the patent of MacArthur-Ellis in 1896, for the prevention of sulpho-cyanides passing into solution when treating ores containing sulphides soluble in cyanide solutions. This patent provides for the addition of carbonate, acetate, or sulphate of lead, so that the insoluble lead sulphide is formed in advance, and the working solutions freed from alkaline sulphides.²⁹

One of the greatest obstacles to successful cyanidation in the early nineties was the omnipresent slime. My earliest experience indicated that even in dry crushing it was the better practice to separate the dust from the sand and treat each separately, and furthermore the same principle was still more important in wet crushing, where it was usually imperative to separate the slime from the sand. A United States patent was issued to me in 1894 for apparatus to separate slime and dust from ores,³⁰ and was used in the Brodie mill at Cripple Creek and the Metallic works near Florence. My first method for treating the separated fine material was briquetting and roasting, then rough crushing and cyaniding. The high extractions made on the roasted product first turned my attention to the advisability of roasting in bulk the telluride ores of Cripple Creek, at that time almost en-

*A paper read before the Colorado Scientific Society on November 2, 1907.

²¹British Patent, No. 12,641, July 8, 1892.

²²U. S. Patent, No. 482,577, Sept. 13, 1892.

²³*Engineering & Mining Journal*, Nov. 12, 1892.

²⁴*Trans. Inst. Min. & Met.*, London, Vol. 7, p. 36, 1898.

²⁶*Prac. Cyanide Operations (Gaze)*, p. 10, 1898.

²⁷U. S. Patent No. 610,616, Sept. 13, 1898.

²⁸*Engineering & Mining Journal*, Aug. 15, 1903.

²⁹U. S. Patent No. 555,463, Feb. 25, 1896.

³⁰U. S. Patent No. 527,473, Oct. 16, 1894.

tirely oxidized, but with the rapid development of the mines they suddenly changed to sulpho-tellurides—in part at least—before we could get roasting furnaces installed in the works.

The decantation process of slime treatment should next be noticed. It was developed in South Africa, and at present practically all the slime on the Rand is treated by this method, which consists in agitating the slime in weak cyanide solution, usually by means of centrifugal pumps, circulating the sludge from one vat to another, then allowing the slime to settle, decanting the clear solution, adding water, and again agitating and repeating the process till the gold in solution is reduced to the tenor of practical requirements. The decantation process has been gradually developed in South Africa by Butters and others; the process now in use was first successfully applied to the Rand ores by John R. Williams about the year 1896.³¹

One great advantage of the cyanide process over all other practical methods of gold extraction is the fact that it will dissolve gold and silver from raw or unroasted ores. This feature was naturally made the most of in early day advertisements by the MacArthur-Forrest people. It did not, however, apply on sulpho-telluride ores, in the treatment of which roasting became a leading feature; this was first, I believe, introduced on a commercial scale by myself at the plant of the Metallic Extraction Co., at Cyanide, near Florence, Colorado, in the treatment of Cripple Creek ores in 1896.

Roasting introduced many difficulties and complications, chief of which were the sulphate salts in poorly roasted ores, but these troubles were gradually overcome, and today I can not only look back at the successful cyanidation of over a quarter million tons of roasted ore, but I can also affirm that my experience in cyaniding Cripple Creek ores has led me to the unalterable conclusion that my early efforts were in the proper direction, and that cyanide properly applied is the correct treatment for those ores, because they can be cyanided for about one-half the present cost of chlorinating them and with better extraction. Considerable difficulties were experienced in the early days of cyanidation in securing good precipitation from dilute solutions, until the introduction of the zinc-lead couple by MacArthur,³² and the zinc-mercury couple by Caldecott,³³ made possible the effective precipitation of the gold from the most dilute solutions; meanwhile an electrical process of precipitation by Siemens Halske had been introduced in the Transvaal and worked with considerable efficiency on dilute solutions. The anodes were of sheet iron, the cathodes of lead foil, weighing 0.19 lb. per sq. ft. When precipitating from 84 gr. gold per ton of solution down to 8 gr. per ton, it required 9,000 sq. ft. of cathode surface to precipitate 100 tons of solution per day.³⁴ Improvements in the process, such as the substitution of Andreoli's lead peroxide anodes for the iron plates and the use of a high-density current, did not succeed in bringing it into general use, and though ingenious and somewhat successful, it cannot be said to have spread beyond the control of those interested in the patents.

I will next direct your attention to the Clerici-Pelatan process,³⁵ in which the ore is reduced to extreme fineness (slimed) and then treated by agitation in an electric vat with dilute cyanide solution containing sodium chloride. The tank bottom is covered with mercury or amalgamated plates, to form the cathode of an electrical cell; the revolving stirrers are the anodes; the gold is dis-

solved and precipitated in the mercury. Many advantages were claimed for this process, such as amalgamating coarse gold, dissolving and precipitating the gold in one operation and in one vessel; thus leaching is abolished, as is also the use of zinc.

This process has been tested on a working scale in Colorado and several other Western States, but is, I believe, not in use today to any extent. It proved too expensive, for the sole reason, in my opinion, that the precipitation of the gold from a muddy electrolyte, on such limited cathode surface took too much time; the gold goes into solution quickly enough, but the power spent in agitating the mass during the interval necessary to precipitate the gold from solution is at once the weak and expensive point. To illustrate this: In a test made for me by the patentees in 1894, \$2 per ton in gold remained in solution after 7 hours' operation, while, by passing this solution through a zinc precipitation box, the gold could be reduced to 4c. per ton in 15 minutes. I was, therefore, compelled to report against the process to my principals, and subsequent events have confirmed my conclusions.

The introduction of the cyanide process in West Australia to treat sulpho-telluride ores has been fruitful in invention. These ores contain 15 to 20% lime, and early developed the nasty trick of setting in the vats like so much concrete. (I refer, of course, to the roasted ore.) The first apparent success consisted of amalgamating in pans the finely ground ore, then filter-pressing to get rid of the acid salts resulting from bad roasting; next treating the cakes from the filter-press with cyanide solution, and lastly filter-pressing again to drive out the gold-cyanide solution. This process cost about \$10 per ton, but is much simplified and now reduced to about \$3 per ton.

The process used at Kalgoorlie in its improved form consists of roasting the finely ground ore to break up all sulphates and reach, when possible, a dead roast; next, grinding the roasted ore in pans or tube-mills until 98% of it passes a 200-mesh screen; next, agitating in cyanide solution until the gold is dissolved, and, lastly, filter-pressing direct from the agitators. This method of treatment is known as the all-sliming cyanide process. The fine-grinding methods of ore-treatment developed in West Australia introduced the filter-press and the tube-mill into the cyanide process, both, it is said, by J. W. Sutherland, in 1898, though West claims,³⁶ that a one-ton Johnson filter-press was in use at Hannan's Brown-hill mine in 1896, and about the same time the Lake View Consols Co. was experimenting with a centre-filling filter-press. McNeill³⁷ describes the Hannan's filter-plant as first installed, but the date is not definitely referred to. Knutsen³⁸ claims that filter-presses were first thought of on the Kalgoorlie field in 1897, while Diehl used them (on ores from Kalgoorlie) at Hamburg, Germany, as early as 1896. The tube-mill, flint-mill, or pebble-mill, as it is variously called, has been in successful use in the cement business for some time prior to its introduction in practical cyanide work in West Australia. The tube-mill, as I prefer to call it, has proved to be the best sliming machine so far discovered, but it is nevertheless pushed hard by grinding pans of the Wheeler type even in the sliming of ores, while the pans excel as fine grinders to, say, approximately 100-mesh. The filter-press had a short-lived victory, for by the time it was perfected from an ore-treatment point of view, and the costs reduced to something reasonable, the development of the suction-filters showed clearly that the massive cumbersome filter-press, extremely costly to install and expensive to operate, could not successfully compete with the simpler, cheaper, and much more efficient suction-

³¹Julian and Smart, 'Cyaniding Gold and Silver,' p. 230, 1904.

³²U. S. Patent No. 502,153, Oct. 19, 1897.

³³U. S. Patent No. 620,100, Feb. 25, 1899.

³⁴Julian and Smart, p. 146, 1904.

³⁵U. S. Patent No. 551,648, Dec. 17, 1895.

³⁶U. S. Patent No. 553,816, Jan. 28, 1896.

filter, which is now rapidly displacing the filter-press in many of the goldfields of the world.

The Diehl process, also used at Kalgoorlie and, in fact, elaborated for the treatment of those particular ores in the raw state, presents some interesting features, if not new departures, in cyaniding. Owing to the high cost of fuel, labor, and power, roasting on this goldfield is very expensive, and while the Diehl process only partially eliminated roasting, yet this method is extremely interesting, showing, as it does, the great possibilities of cyanidation, when the ore is reduced to an extremely fine state of division.

In its latest form the Diehl process is found in operation at Kalgoorlie: First, the raw telluride ore is stamped in dilute cyanide solution in batteries, using the ordinary outside and inside amalgamating plates. Second, the crushed ore is passed over concentrating tables, and the concentrate resulting from this operation is roasted and amalgamated. The third step is grinding the tailing from the tables in tube-mills to an impalpable powder, practically the entire produce passing a sieve of 200 mesh per linear inch. In the fourth operation the slimed ore is agitated in vats for two hours in a 0.2% cyanide solution; bromo-cyanogen is then added at the rate of 0.04% of the dry tonnage of the charge, and agitation continued for 22 hours. The charge is usually complete in 24 hours' treatment, though it may require a further addition of bromo-cyanogen.³⁹ The last operation is passing the pulp through filter-presses, the filtrate going to the zinc-precipitation boxes and the residues in the form of cakes, 39½ in. square and 3 in. thick, to the waste dumps. The cost of bromo-cyanogen in this process runs from 50c. to \$1.50 per ton in ores varying from ½ to 1 oz. gold per ton. The Diehl process is based, first, on the removal of the greater part of the tellurides by concentration and roasting for the liberation of the gold before treating them by amalgamation in cyanide solution; second, sliming the tailing and treating the pulp by agitation in cyanide of potassium solution, to which is added from time to time bromo-cyanogen, which salt will partially attack the tellurides, insoluble in straight cyanide. The success of the process, however, depends chiefly on the thoroughness of the concentration, as high-grade tailing from the concentrating mill invariably means high final tailing after agitation with bromo-cyanogen. The process, in brief, amounts to the removal by concentration of a deleterious material from contact with the cyanide solution, "to be handled by such other methods as the particular circumstances will indicate," as pointed out by me in 1894⁴⁰ in an attempt to show the scope of the cyanide process, and that it could "be applied to ores direct, or as a combination process, with amalgamation or concentration, or both, as may be found most convenient for the economic treatment of the ores." The credit for using bromo-cyanogen on telluride ores belongs to Sulman and Teed.⁴¹ The Diehl process has made no progress outside Australia, and even there it is declining. Where roasting charges are high, the process has a fair chance on ores below a valuation of \$8 to \$12 per ton, depending on local conditions.

Yet another West Australian process is known as the Rickens, an attempted improvement on the Clerici-Pelatan, introduced at the old Telluride mill, Colorado City, about the time of its abandonment at Kalgoorlie, the place of its birth, the improvement consisting of an increase of the active surface of the electrodes by the

addition of side plates in the Rickens vat against bottom plates only in the Clerici-Pelatan, and in circulating the mercury so that in passing over the side plates in streams it kept them soft and active. The precipitation, however, was unsatisfactory, and filter-presses were added to the West Australian plants, so that the auriferous cyanide solutions could be displaced from the residues and the gold extracted from them in zinc-boxes. The process then failed in its most important point, precipitation of the gold. To one who has had experience in electrical precipitation from cyanide solutions and is familiar, not only with the large cathode surface required to obtain complete precipitation, but also the time consumed in effecting it, this result is the only one to be expected. When we stop to consider that the gold in this finely comminuted dust treated in the Rickens vat can be brought into solution in two hours, without the aid of electricity, and separated from the residue by a filter in a similar period of time, and the precious metals precipitated on zinc in 30 minutes, a total for the whole process of only 4½ hours, the uselessness of the process for the treatment of dust and finely pulverized ore becomes apparent. Furthermore, it scores another failure of the oft-repeated scheme so dear to the process inventors, *attempting to precipitate gold from a muddy and foul electrolyte*. Others have since attempted to solve the same problem, but with like result. Hence it has become common knowledge that clear solutions are conditions precedent to successful precipitation from all cyanide solutions; and so we come to the last step in cyanidation in which filtration is the dominant note.

Moore obtained an American patent for a suction-filter in 1903, which was introduced at the Mercur Mines (Utah)⁴² but on account of defective mechanical contrivances the filters were not quite satisfactory and were subsequently abandoned; in other places, however, the Moore filter has been quite successful. The Moore suction-filter, as is well known, consists of a series of leaves, or rectangular cells with permeable walls, through which the solution is forced, when a vacuum is created in the interior of the cell, leaving the solids (slime) to form cakes on the cell-walls. A number of these cells are bound together in a so-called basket and immersed in a vat of slime until cakes of necessary thickness have formed; then the basket is lifted from the vat and transferred to a wash-water vat and the vacuum maintained in the interior of the cell until the soluble gold has been replaced by wash-water, when the basket is again hoisted, brought over the dumping place and compressed air turned on to displace the cakes. A second patent was issued to Moore in 1904 covering some other features in his filtering process.⁴³ The Moore filter might be briefly described as a movable suction-filter in a fixed vat.

Cassell obtained a patent in 1904 for what might be briefly described as a fixed suction-filter in a fixed vat.⁴⁴ In this apparatus the slime and solution are circulated around the fixed filter by means of a centrifugal pump, and when the cakes are finally washed they are displaced by water or air and discharged through the doors provided for the purpose in the bottom of the vats. Both the Moore and the Cassell filters provide vacuum-pipes for lifting the filtered solution from the bottom of the cell to the discharge at the top—usually some six feet—but let us assume the head will be balanced by a pressure of 2.5 lb. per sq. in., and it will be seen that 25% of the vacuum usually obtained in mining districts of the west (10 lb.) is not available for filtration in this form of apparatus. A third type, the gravity suction-filter, will soon be on the market, with capacity for making 25 tons and 50 tons of

³⁹U. S. Patent No. 567,503, Sept. 8, 1896.

⁴⁰U. S. Patent No. 623,822, April 25, 1899.

⁴¹*Trans. Inst. Min. & Met.*, London, Vol. 14, p. 250, 1905.

⁴²Same, Vol. 6, p. 247, 1898.

⁴³Same, Vol. 12, p. 9, 1903.

⁴⁴Same, Vol. 12, p. 13, 1903.

⁴⁵*Engineering Magazine*, p. 810, September, 1894.

⁴⁶*Trans. Inst. Min. & Met.*, Vol. 3 (2), p. 202, 1895.

⁴²U. S. Patent No. 748,088, Dec. 23, 1903.

⁴³U. S. Patent No. 764,486, July 5, 1904.

⁴⁴U. S. Patent No. 773,473, Oct. 25, 1904.

filter-cake at each cycle. This apparatus may be described as fixed filters with a movable vat and gravity flow from the bottom of the filter-cells to the vacuum-pump.⁴⁵ When the vat is moved back all the filter-cells are completely exposed and the cakes can be dumped practically dry. Lastly, we have the Ridgway continuous filter, said to be operating quite successfully in West Australia. In this form of suction-filter a central rotating vertical axle carries arms with depending filters which slowly pass through an annular slime-vat while the cake is being formed, thence through wash-water, and next to the dump, where compressed air is turned on to displace the cakes, thus completing the cycle, and the filter again entering the slime-vat for the commencement of the next cycle. The arms are automatically raised when passing from one division of the annular vat to another, and the valves to the strong and weak solution and of the compressed-air line are automatically operated as the machine revolves.

Returning to my brief review of the cyanide process, it is quite clear that no chemical improvement of any moment has been made on the process as evolved by MacArthur and Forrest. Weak solution and filiform zinc are everywhere in use today; ores are universally prepared for cyaniding by neutralizing the acidity with lime, while lead salts are invariably used in the cyaniding of heavy sulphides or badly roasted ores. Improvements have been almost entirely along engineering lines, in crushing or pulverizing, in sliming, in agitating, in filter-press work, and in suction-filters; in fact, all along the line of mechanical engineering improvements have been many, and progress steady and continuous.

A TAILING CONVEYING SYSTEM.—Recently there has been installed at the Mohawk mill on Traverse bay, near Gay, Michigan, a new system for disposing of the mill-tailing. This problem is a very important one in the level country around Lake Superior. This system is designed to do away with the cost and maintainance of a sand-wheel where the natural elevation does not suffice. The idea originated with J. F. Jackson of the Wisconsin Bridge & Iron Works, but it was worked out in detail and built by the Mohawk company. The tailing launders discharge into a large tank a short distance from the mill. The sand settles to the bottom of this tank and is elevated to the desired height by means of four bucket-elevators, the buckets being 21 in. long, 11 in. wide, and 13½ in. deep; these are perforated to allow the water to drain. Each elevator, operated by a 2½-hp. motor, travels at a speed of from 30 to 35 ft. per min., discharging its load of sand into a hopper which distributes it onto a belt-conveyor. This conveyor is an 8-ply rubber belt, 20 in. wide and 700 ft. long, operated at a speed of 300 ft. per min. The water is taken out of the large settling-tank by two launders, each 30 in. wide and 14 in. deep, which discharge into a semi-circular steel launder 52 in. diam. This launder is 740 ft. long, or about 40 ft. longer than the conveyor and is placed directly below it. The sand drops from the end of the belt-conveyor into this launder and is finally discharged at a distance of 750 ft. from the stamp-mill.

MACHINE-SHARPENED BITS seldom last as well as those sharpened by hand, but machine-sharpened drills are gauged and so always follow. This is a great saving, as generally when hand-sharpening is used considerable trouble generally arises from the failure of some of the drills to follow. It seems to the miner that this always happens when he is most pushed for time to finish his round.

Radium in the Rocks of the Simplon.

The principal classes of material which enter into the composition of the massif of the Simplon are: (a) The Jura-Trias sediments, lithologically often much alike and much interfolded; (b) the Paleozoic crystalline schists; and (c) the gneiss of Monte Leone and the Antigorio gneiss, both stated to be of Archean age. These rocks throughout contain radium, and for the most part in quantities much above what hitherto has been ascribed to sedimentary or igneous rocks.

Some 36 typical samples, taken from various points in the tunnel, have been examined. The poorest in radium are certain anhydrite rocks. Certain amphibolite schists go very high. The Antigorio gneiss rises from 10.5×10^{-12} and 8.0×10^{-12} grams radium per gram of rock at the Italian entrance to 23.7×10^{-12} at 4,000 metres inward. Some of the Archean gneisses yielded very high results.

Such quantities of radium if generally distributed throughout the rocks of the massif would be sufficient to disturb any forecast of the temperature which under normal conditions would be encountered at the level of the tunnel. It is suggested that the radium was in fact the source of the discrepancy between the predicted and the observed rock temperatures.

As it is improbable that these results are unique and apply only to this particular sedimentary accumulation and locality, they appear to point to hitherto unsuspected quantities of radium (and its parent elements) in the immediate surface materials of the earth. It seems impossible to avoid the conclusion that these elements were precipitated along with the sediments entering into the composition of the massif. The question then arises whether the accumulation of such quantities of radioactive elements may not enter as a factor in the events attending mountain-building. It can be shown that an area of sedimentation whereon has been accumulated some 10,000 metres of sediments, having a richness in radium comparable with the Simplon rocks, must necessarily become an area of greatly lessened crust-rigidity, and would hence become the probable site of crust-flexure under tangential compressive stress.

Further investigation will be required before such views can be generalized and the importance of radium as a source of instability of the earth's crust be determined.

Apart from any speculations as to the influence of radium as the cause of an energetic substratum, the shifting of radium and its parent elements by denudation must be regarded as a convection of thermal energy, and this convection, if the quantities involved are sufficient, must, under the conditions referred to above and the unceasing action of denudation, become rhythmic in operation, and at the same time must result in shifting the areas of high temperature and crust-weakness from age to age as the site of sedimentary accumulation changes.

THE 'BANKET' OF THE RAND was, according to J. W. Gregory, originally a marine placer, in which gold and black sand (magnetite, with some ilmenite) were laid down in a series of shore deposits. The gold and black sand were concentrated by wave action and collected in the sheltered places between the pebbles; later, after the pebbles had been cemented to form a conglomerate, the black sand was converted to pyrite and the gold was dissolved by the same mineralizing action and re-deposited in situ.

⁴⁵Read before Section C, British Association for the Advancement of Science, Leicester, 1907, by J. Joly. Abstracted from *Science*.

⁴⁵¹S. Patent No. 803,827, June 5, 1906.

Topographical and Other Notes on the Choix-Guadalupe y Calvo Mining Districts.

Written for the MINING AND SCIENTIFIC PRESS
By A. W. WARWICK.

The Sierra Madre Occidental, of Mexico, is scenically grand; it presents forms as grotesque and as varied in color as the soul of an artist could wish. The magnificent gashes in the ranges known as *barrancas* cause even the

history, however rugged they may be, do not constitute scenery. The fine photographs of the great masses of the Himalayas do not appeal to me like even an amateur's picture of the Matterhorn. The great silent unhistoric Himalayas are just a wall between two countries, and beyond the fact that they are hard to cross, have little interest. The fearful cliffs of the Matterhorn have witnessed heroic effort in which men have lost their lives in an endeavor to conquer nature. But at last they were

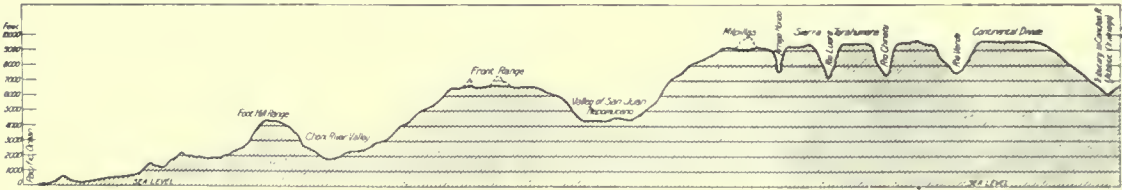


Map of a Part of Western Chihuahua, Mexico.
From Surveys by A. W. Warwick.

most unimaginative to pause, wonder, and admire. The range of climate and vegetation, the different racial characteristics of the people, the cliff-dwellers living like the old cave men, the sun-worshippers still practising their rites after centuries of missionary effort, all go to lend these mountains that cloak of mystery which is so attractive to mankind.

It has been my fortune to spend the better part of seven

beaten and were sealed. The Matterhorn has a history that gives an impelling interest to its grand escarpments. Riding the trail with only a mozo, going hour after hour without sight of a human habitation, or bird, or beast, the traveler becomes terribly lonely and weary, greatly adding to the physical fatigues due to riding over those rough unworked paths of the Sierra Madre that are dignified by the name of *caminos reales*. One longs for an



Cross-Section Through the Sierra Madre Occidental.

years in these mountains, mainly between latitudes 25° 30' and 27° and longitude 106° to 108° 30'. I may be permitted to say that ethnology is beyond the scope of my work and that mere pilings up of mountains have long since ceased to be marvels, or even to be appreciated, unless with a sympathetic companion. The country is too raw and lacks that touch of human effort which is required to hold the interest of the average man. Mountains without engineering work of some kind and without

occasional flume or ditch on the mountain, even if it does make a straight line in the landscape. To prevent becoming stale, normal man must have diversion. The first thought is naturally, that a mining engineer could never lack for interests by making geological observations. This is true to a certain degree, and on the first trip over a trail, one has much to see of interest. Mule-back geology, however, has marked restrictions, and mule-back determination of rocks is even more lim-

ited in its scope. Without a map of reasonable accuracy, geological observations have little real value. Without such a map geological relationships are masked or may be entirely misread. No accurate maps of the country in which the writer has been working exist, and an extraordinary ignorance prevails as to bearings and distances of places even very close together. Guides who know the trails to places off the main lines of travel are scarce. Nor is this reproach to be confined to the Mexicans. Of all the engineers who have traveled the trails from Parral to Guadalupe y Calvo, there are few indeed who could give anything like a correct trail-map or locate Guadalupe y Calvo within miles of its true position on the general map of Mexico.

A number of maps of the States of Sinaloa and Chihuahua have been published; they appear to be, in most cases, compilations from sketch maps made by men who were rarely engineers. These sketch maps, of which I have seen a great number, contain no astronomically fixed points, and the distances and bearings seem in most cases to be simply estimates or to have been put on the map from information received from *arrieros* whose knowledge is very much '*mas ó menos*.' For my part, I have an intense dislike to travel in an unknown direction. Not to appreciate one's relative position to known places gives a lost feeling that is peculiarly disagreeable. The trail seems to drag out and to be of no interest. All observations become valueless, for they do not fit into any scheme, nor can they be correlated with facts already noted. One needs a map on which to place data and to read their story correctly.

During the last few years, therefore, a series of maps have been made of the lines of travel, each addition being more accurate and complete. The collection of data and the construction of the map has been the solace of many a weary hour on the trail, and has caused observations to be made that otherwise never would have been thought of. Finally, there can be no question but that the working out of the details of the map has given a knowledge of the country such as the use of a map already constructed by another could never give.

At first the maps made by me were based almost entirely on 'dead reckoning,' that is, on estimated rate and direction of travel controlled by compass readings and the speed of my saddle animal. Gradually, however, considerable detailed survey work was done in a number of districts, and opportunities were presented for determining the correct distances and bearings between a large number of mountain peaks forming convenient base-lines. Laterally, work done in the foothill range has resulted in giving bases, enabling me to close a survey line from the coast to Guadalupe y Calvo. The magnificent mountain near Alamos, known as Los Frailes, rising out of the plains, together with a number of peaks in the foothill range, formed several convenient bases. The great peaks Muinora, Milpillas, and Guilona form three magnificent base-lines in the main Sierra. The latitude and longitude of Guadalupe y Calvo is capable of being determined with slight error, since it has a Federal telegraph office which daily receives signal of mean noon from the national observatory at Tacubaya. Cerro Milpillas can be seen from Guadalupe y Calvo and its distance and bearing closely determined. Thus, by triangulation, the latitudes and longitudes of Guilona, Milpillas, and Muinora are found. These peaks can be seen and identified at long distance and really form the main survey points for the southeastern area. A number of minor peaks, the position of which is accurately known, serve to fix many points. Two of the most important of these are Cerro Estacion; at Las Yedras, and Bufa de Los Angeles, at Los Angeles.

In the northwest portion the base-lines are formed by Cerro Chileno, Los Frailes, Cerro Viejo de Baimena, and Cerro Cocoa; all of these are distinctive peaks capable of being seen from both ends of a three-mile base-line from Cerro Sancillo to the Mina Mexico. From this short base-line many other important places were accurately placed, such as Choix, Lluvia de Oro, etc.

It happens, fortunately, that both the Frailes and Cerro Chileno can be clearly seen from El Fuerte, in which place the determination of latitude and longitude is rendered more accurate by having telegraphic time from Tacubaya. Thus the latitude and longitude of the main peaks, used as the ends of the western base lines, can easily be calculated. This work was all done by ordinary light mining transits, with the limit of accuracy set by such instruments, although every effort was made to check the work and reduce the error to a minimum. Many data were also collected by surveys made in the districts of Los Angeles, Mala Noche, El Tesoro, Sabinito, and Mina Mexico. Upon these bases the map was constructed, taking Guadalupe y Calvo as $106^{\circ} 52' W$ longitude from Greenwich and $26^{\circ} 5' N$ latitude, and El Fuerte as $108^{\circ} 38' W$ longitude and $26^{\circ} 28' N$ latitude.

The positions of most of the points on the map were fixed by intersections of magnetic bearings taken on the peaks, using a mean variation of $10^{\circ} 45' E$. Determinations of true meridian were made generally on Polaris, and gave at

Los Angeles.....	$10^{\circ} 48' E$	Sabinito.....	$10^{\circ} 46' E$
Mala Noche.....	$10^{\circ} 45' E$	Mina Mexico.....	$10^{\circ} 48' E$
Tesoro.....	$10^{\circ} 36' E$	Oran average of	$10^{\circ} 44' 24''$

The instruments used were a light mountain transit, and (for use when traveling rapidly from one place to another), a little instrument with hair sights made by Lallie, of Denver, in which angles could be measured to within one minute, independently of the needle. Of course close 'dead reckoning' was kept continuously on the trail by means of time of travel and a pocket compass with sights. Elevations were determined by the aneroid. Every trail marked on the map has been traveled at least twice, and some of them many times. The result is that every important determination has been checked several times, and a great many absolutely independent determinations have been made for most of the places. Frequently there would be three or four positions for the same place, and when they substantially agreed the average was taken. Many trips over so many trails, together with repeated and careful observations from many hundreds of points, go to confirm the impression that no serious error will be found in the accompanying map, which, however, is merely presented as a reconnaissance map, which may serve as a useful guide to an area of some 5,000 square miles of intensely mineralized country.

The mountain system was worked out from aneroid readings, aided by sketches and observations made from high places. The mountains at first seemed an inextricable jumble, but gradually, as the area covered by travel became more and more extended, the system became clear. In the area studied three distinct ranges developed, the Foothill, the Front, and the main Sierra. On the extreme west the Foothill range rises rather abruptly from a broken irregular plateau of between 1,600 and 2,000 ft. elevation. The summits of this range are flat and mesa-like, reaching a height of 4,300 ft. The east slopes fall easily to a valley through which the Choix river flows northerly, with tributaries of the Sinaloa flowing south. Going east the magnificent Front range rises to heights of 7,500 ft., although the average height is several hundred feet less. The summits are

covered with a fine growth of pine. The great *barrancas* or *quebradas* that cut into this range frequently reach depths of over 5,000 ft. below the rims. This, together with the coolness of the atmosphere and the general sense of being in lofty mountains makes it at times almost impossible not to believe one's self in the high sierras. The petrological character of this range, however, is so markedly different from the main sierra, the general elevations of the crests being at least 2,000 ft. lower, and the existence to the east of a valley often very broad, and with a floor of less than 3,500 ft. average altitude go to establish its identity as a distinct range. It is cut through in the north by the Fuerte river, and at its south end by the Sinaloa river.

On the east side of the valley rise the great west escarpments of the Sierra Tarahumara, deriving its name from the great Indian tribe that long dominated it and which still numbers over 20,000. This range forms, of course, one of the great mass of mountain ranges known collectively as the Sierra Madre. The axes of these ranges run roughly northwest and southeast. A cross-section suggests step-faulting on a gigantic scale. A generalized section from the Pacific coast to the continental divide is presented herewith.

The working out of the drainage system was exceedingly interesting. The watersheds of the Fuerte, Sinaloa, and Culiacan rivers so interlock that the final unraveling was not particularly easy. It was made more difficult by the custom of changing the names of the rivers every few miles, making their identification laborious. The two great river systems of the area are those of the Fuerte and Sinaloa. They present many interesting differences. The Fuerte rises in the high plateau and the tributaries flow in great gashes running northwest or southeast until they meet that great east or west *barranca* known as the Verde, San Carlos, or Guerachie, in different places. These *barrancas* form one of the great natural wonders of northern Mexico and must be seen to be appreciated. The east or west *barranca* is often over 5,000 ft. deep from the rim-rock, with great cliffs many hundreds of feet high rising in succession from the river-bed. The regularity of the northwest and southeast gashes, practically paralleling the axis of the range, suggest that the Tenoriba, Babrugame, Luera, and Chinatu rivers follow fault-planes, nor is it unlikely that the *barranca* of the Fuerte river is also a great east and west fault-plane. It is a curious fact that traveling northeast at right angles to the axis of the Sierra Tarahumara, the tributary river-beds have all approximately the same elevation of 7,000 feet.

A casual glance at the map gives the impression that the Sinaloa river also rose from the high plateau. This is not so. It derives by far the greater volume of its water from the area between the Front range and the Sierra Tarahumara. While readings of from 6,500 to 7,500 ft. are common in crossing strong deep tributaries of the Fuerte, at no point can an aneroid reading of over 4,000 ft. be obtained in a Sinaloa tributary at any point where it could be dignified by the name of river. A few unimportant *arroyos* come off the main sierra to join the Muinora river. The junction of the Santo Domingo, Bazonopa, and Muinora rivers, which form the Sinaloa, occurs at an elevation of only 2,000 ft. A peculiarly majestic scene is that of the Muinora river flowing northwest to meet the Tahomitas, which rushes southeast, both sweeping round the flanks of Cerro Muinora, towering 8,000 ft. above the river-bed. The Sinaloa cannot be said to come out of the Sierra, but flows around its base. The Fuerte river follows definite lines; the Sinaloa seems to wander through a maze of mountain ranges boxing the compass on its way to the sea. The Fuerte flows

through precipitous *barrancas* with walls of volcanic rocks, while the Sinaloa runs through a wider valley with sedimentary rocks prevailing.

Geologically the area is of great interest. The first impression on coming into the country from the east is that it is simply a dreary breccia and tuff-covered mountain district with an occasional small area of andesite, rhyolite, or granite. In going westward, however, the traveler sees a notable variety of rocks, which are of interest not only for their structure, but on account of their mode of occurrence. The southwest portion of the area, to the extent of hundreds of square miles, is covered by sedimentaries. A line drawn roughly between Jecorato, Yedras, and Dolores is the northeast boundary of the sedimentary area. These sedimentaries are of unknown age, owing to the absence of fossils, which were persistently sought without success. Shales and quartzites prevail, but considerable limestone also is to be seen in some portions of the area. As was to be expected, the formation is highly contorted, faulted, or intruded by igneous rocks. In the northwest, limestones are to be found in abundance, and there is strong evidence that they are of Jurassic age.

The geology of these mountains is too complex for off-hand treatment. Practically, the geology has never been systematically studied, and much patient work remains to be done before clear or definite statements can be made even as to the main facts. Economically, the area promises to become one of the most important in northern Mexico, mainly, of course, from a mining point of view. While it contains some fair farming land, good grazing land, and much fine pine timber, these resources are of little value unless the minerals are developed. While, as a general statement, it is true that the mineral area is virgin, yet it contains many notable mining districts either productive now or famous for past production. The most noteworthy districts are those of Lluvia de Oro, Los Cueros, the Choix valley, the placers of the headwaters of the Jecorato river San José de Gracia, Calabacillas, La Cumbre de San Manuel, Jedras, San José de Crucis, Morelos, La Dura, Los Angeles, Santa Cruz de Santa Ana, Refugio, Guadalupe y Calvo. The last three mentioned are known to have produced more than \$60,000,000 during the first half of the nineteenth century when worked by English-Scotch companies. As for districts that have local reputations as good prospects, their name is legion. The country is intensely mineralized and will undoubtedly be heard from, when the right kind of miners take hold of it and transportation is improved.

The country has been well prospected. It is safe to say that after generations of persistent search, all the big rich veins that show well at surface have been found, and in them such ore as can be conveniently broken down has been removed and treated long since. The result is that the country has large numbers of veins with considerable work done on them, and with local reputations as having produced greatly, but with every pound of good ore removed and nothing left to show whether the property is worth re-opening or not. Speaking generally, mines in the sense of having ore reserves developed are few and far between, and these are invariably in the hands of Americans. It is not a country where a man can wander and pick up good mines for a few hundred dollars, as so many seem fatuously to believe. It is essentially a country that needs a happy combination of mining skill and capital behind it to win success.

The largest iron mine is that of the Oliver Iron Mining Co. in Minnesota. It is an open pit covering 200 acres, and will be 160 to 200 ft. deep.

Cyanidation With the Brown Vat.

Written for the MINING AND SCIENTIFIC PRESS
By FRANCISCO NARVAEZ.

The San Francisco mill is situated on a hill adjoining the El Sotol mine; it was designed for pan amalgamation and was transformed into a cyanide plant recently.

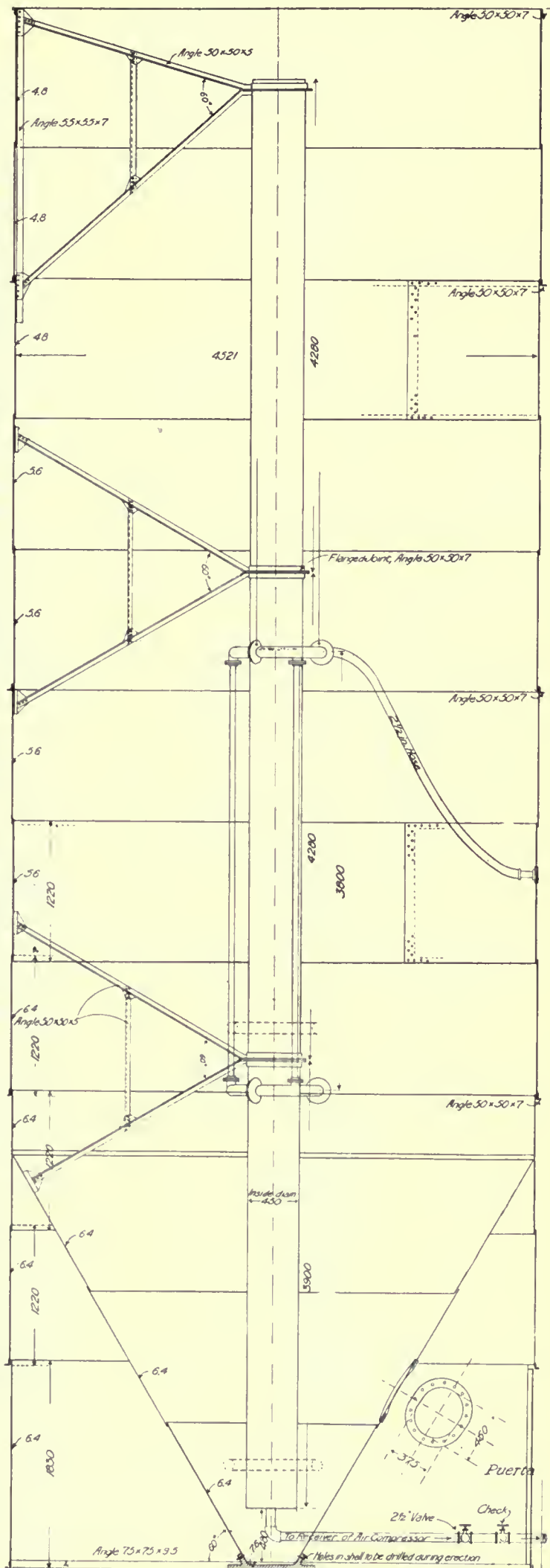
The ore is delivered to the bin of the mill from the Sotol mine by means of a portable track and little cars of 500 to 600 kg. capacity. Before dumping, the cars are weighed on a scale and samples are taken. The ore is broken to pass through a 1½ to 2-in. ring by means of two breakers of the Dodge type, and then it falls to the ore-bins behind the stamps. The mill consists of 30 stamps of 1,050 lb. each, dropping 90 times per minute, through a height of 7 in., using Tyler double-crimped 16-mesh wire-cloth, and grinding at the rate of 2.8 tons per head per 24 hours.

The pulp from each battery is directly discharged, through a 2-in. pipe, onto a Wildfey table, making 250 strokes per minute. This separates about 15% of the gold and silver in a concentrate. The tailing falls into a launder leading to a conical hydraulic classifier. The overflow is sent directly through a 6-in. iron pipe to the Pachuca 'Agitating Tanks,' the underflow being elevated by means of a Frier sand-pump to a battery of Boss pans for re-grinding. These pans have been discarded lately on account of bad results, and are likely to be replaced by two Krupp tube-mills. In the meantime the wire-cloth of the batteries have been reduced (so as to obtain a finer grinding) to 25-mesh of cloth of the same make.

The Pachuca agitating tanks, as they are called locally, were introduced in this district by Albert Grothe, who is the patentee, although the invention is credited to Mr. Brown of West Australia. They are of steel, cylindric in shape and terminating in a conical bottom. The cylindrical part is 30 ft. high and the conical 15 ft., the diameter being also 15 ft., although those ordered for the San Rafael mill will be 20 ft. in diameter. On the inside and in the axis is situated a pipe which runs from top to bottom, 15 in. diam., within the interior of which and in its lower part a 1½-in. pipe ends, which is connected to the receiver of a compressor.

The vats are filled with pulp the consistence of which has varied, but just now it has been found convenient to keep the ratio of water equal to that of ore, the excess water being decanted by overflowing through a 1-in. pipe, which runs on the top of the vats and connects them.

In starting a vat that has been filled, compressed air is applied through a pipe (a) the valve being opened and closed immediately so as to give a blow that disturbs the whole mass of the pulp, which at the beginning of the operation is settled. Each blow of the piston admits a little compressed air, which, in expanding, forces the pulp up and disintegrates it. Repeated blows of air follow, until finally (the whole mass of the pulp having been disturbed) circulation takes place; then the valve of the pipe (a) needs but a little opening for keeping



the mass in agitation, which at first sight looks like boiling water, so effective is the agitation.

The vat is really an air-lift, working under ideal conditions. This system of pumping requires a good submergence. As the mill has not been running continuously, mainly on account of the difficulties with the re-grinding plant, no available data are to hand indicative of the final results to be obtained by this system; but the following are the results of a test which was made on this mill for the San Rafael mine:

Weight of the ore treated, 96 tons of 1,000 kilograms.
Assay in silver, 541 grams.
Assay in gold, 2.22 grams.

SIZING ANALYSIS OF THE PULP.

Mesh.	%
Plus 60.....	0.6
Less 60 plus 80.....	3.4
“ 80 “ 100.....	43.4
“ 100 “ 150.....	1.2
“ 150 “ 200.....	1.6
“ 200.....	49.4
	99.6

Extraction in concentrate: 14.2% silver; 15.4% gold. The concentrate assayed 11.466 kg. silver and 44 gm. gold per ton. Grinding was done with cyanide solution 0.13 to 0.17% KCy, the strength of which was taken up to 0.3% during agitation, 130 grams of acetate of lead being added at that time per ton of pulp. Agitation took place during 48 hours, the proportion of pulp to solution being 1 to 1.47.

The pulp before going to the vats assayed 0.333 gm. silver and 1.6 gm. gold per ton. Samples were taken during agitation every two hours, the residues after 48 hours agitation assaying 60 gm. silver and 0.2 gm. gold; this corresponds to an extraction by concentration and cyaniding of 88.9% of the silver and 91% of the gold.

The filtration of the slime took place in a Butters vacuum-filter, with 28 leaves. The general results have been satisfactory, although for a good running of the plant the filter wants to be at least doubled, because 28 leaves are not sufficient for the capacity of the plant.

A series of tests have been made personally by the writer on a little vat, which permits the treatment of samples weighing 50 kg., the results of which led to the immediate transformation of our present barrel-amalgamation plant into a cyanide mill, an account of which will be given in a later article.

PLATINUM.—The production of platinum in the United States in 1904 was 200 oz., valued at \$4,160; in 1905 the production was 318 oz., valued at \$5,320; in 1906 the platinum production of the country amounted to 1,439 oz., valued at \$45,189, a four-fold increase in quantity, and more than eight-fold increase in value over the figures for 1905. The principal feature of interest in the platinum industry during the year was the phenomenal rise in prices for ingot platinum, which, beginning with \$20.50 per troy ounce on January 6, 1906, had on November 17 reached \$38, remaining at this figure until the end of the year, after which there was another slight rise in price. In February, 1907, for the first time, a distinction was made between ordinary platinum and hard platinum, that is, platinum rich in iridium and osmium, considerable iridium being allowed to remain alloyed in the platinum of the ingots. Such hard platinum was quoted at \$41 per oz. on February 23, and this price held until April 6, 1907, when the placing on the market of more than 100 lb. by a new producer interested in American developments checked the advance, and on May 4, 1907, ordinary platinum was quoted at \$32, and hard platinum at \$35. Then a gradual decline set in, and the price in October, 1907, was \$23 for ordinary and \$25 for hard platinum.

The Jamaica Earthquake.

*The earthquake was accompanied by a loud noise, described as a deep crushing sound, somewhat suggesting distant thunder but with less boom and more of a roar. Internixed with the natural sounds proceeding from the earth was the crashing of the buildings and the cries of the people, the two together being described as almost deafening. One of the phenomena described by all eye-witnesses was the notable darkness following the shock. The local mortar, rather poor at the best, which was used in most of the buildings, pulverized quickly, and was projected into the air together with other dust in immense quantities as the buildings fell, saturating the atmosphere until it was almost impenetrable to the sun's rays. After the cessation of the shock it slowly settled, covering everything with a thick white mantle of fine calcareous silt.

The greater part of the inhabitants of the island of Jamaica are negroes or mulattoes, although a very considerable number of whites reside in the cities, especially in Kingston and Port Royal. The negroes, although Christianized, retain many of their superstitions and are very demonstrative, a fact which had an important bearing on their behavior and attitude during and subsequent to the earthquake. The very first shock threw them into the greatest fright, but it was far from a paralyzing fright either as regards speech or motion, for the majority fled precipitately from their houses into the streets and open places as a howling mob, alternately screaming and praying, sometimes, it is said, both at once. Even after the vibrations had ceased the excitement and noise continued for some time, and the greatest confusion prevailed. The police and troops were soon out, however, and the wrecked district was carefully patrolled, no one without a pass being permitted to enter. Throughout the shock the whites behaved with a considerable degree of calmness, being without the unreasoning fear which characterized the blacks, yet none could reach the open too soon. Animals, wherever not thrown down by the shock, generally stampeded, horses, mules, and cattle being alike in this respect.

The loss of life on the island, as compiled from identified remains and the list of missing, is officially given as 1,003, almost the whole number of casualties being at Kingston or vicinity. The high death list resulted from the fact that the shock occurred late in the afternoon when the stores and sidewalks were full of people. Outside the city and vicinity the loss of life was not great, although a few people among the mountains were killed by falling rock or landslides. Of the deaths many were instantaneous, but many persons were caught in the ruins and burned in the conflagration which followed the shock.

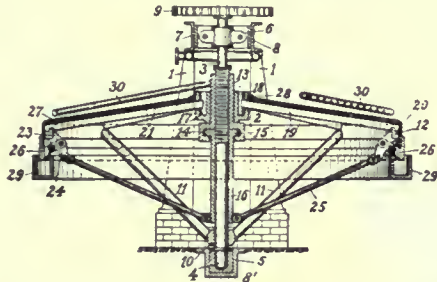
A SUMMARIZATION of the year's business in imports to this country shows that less than a dozen customs districts are credited with five-sixths of the entire foreign commerce of the United States. Stated in the order of magnitude they are in millions of dollars: New York, 1,480; Galveston, 251; Boston, 230; New Orleans, 217; Philadelphia, 174; Baltimore, 145; San Francisco, 90; Puget Sound, 68; Savannah, 66; Mobile, 28, and Chicago, 25. Considering imports and exports separately, the leading ports are in imports: New York, Boston, Philadelphia, San Francisco, New Orleans, and Baltimore; and in exports, New York, Galveston, New Orleans, Baltimore, Boston, Philadelphia, Savannah, Puget Sound, Detroit, San Francisco, and Buffalo.

* From 'Notes on the Jamaica Earthquake' by Myron L. Fuller in *The Journal of Geology*.

MINING AND METALLURGICAL PATENTS.

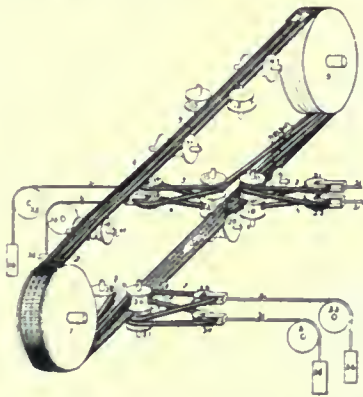
Specially Reported for the MINING AND SCIENTIFIC PRESS.

ROUND BUDDLE FOR DRESSING ORES.—No. 869,883; Albert Demuth, Laurenburg-on-the-Lahn, Germany.



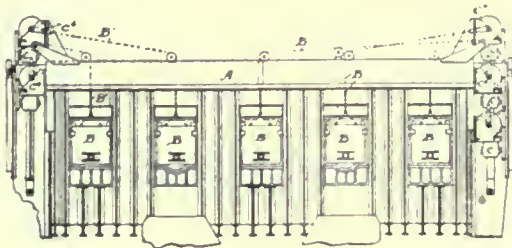
A round-buddle for dressing ores having a table consisting of arms slantwise adjustable in a vertical plane, sector-like plates each attached with one lateral edge to one of said arms and resting with its free lateral edge on the fixed lateral edge of another sectorlike plate, and a flexible cover arranged on the face of said sectorlike plates; and pulp-feeding means arranged above said table.

CONVEYING-MACHINE.—No. 870,050; Percy A. Robins, Englewood, New Jersey.



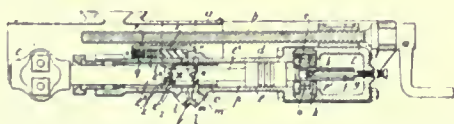
A conveyor comprising head and tail rollers, a plurality of endless bands arranged substantially parallel to each other, an endless belt supported by said bands and means independent of said rollers for tightening said bands.

METALLURGICAL FURNACE.—No. 869,960; John C. Cromwell, Cleveland, Ohio, assignor to The Garrett-Cromwell Engineering Company, Cleveland, Ohio, a corporation of Ohio.



A furnace having a reciprocating door and a motor for moving the door carried by the furnace, a member adapted to be successively and indefinitely rotated by said motor and a connection between the door and the said member and pivotally secured to the latter.

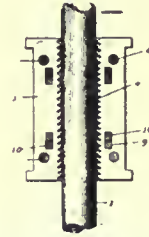
HYDRAULIC ROCK-DRILL.—No. 869,893; George E. Gjuke, Trelleborg, Sweden.



In a device of this class described, a cylinder, a piston, a fluid pressure chamber on the axial line and to the rear of the cylinder in communication with the rear portion of the

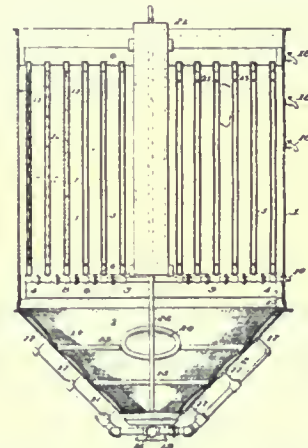
cylinder, and means actuated by the piston for drawing atmospheric air into the fluid pressure chamber upon the working stroke of the piston and compressing it therein upon the rearward or back stroke.

TAPPET.—No. 869,901; Henry Hahn, Stockton, California.



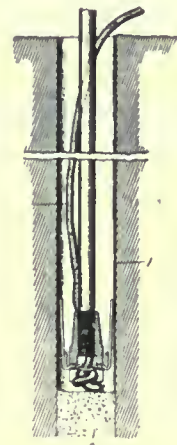
In a device of the class described, a body comprising two members having flat contiguous faces and with oppositely disposed semi-circular cavities in said faces, the flat contiguous faces extending radially of the cavities and in alinement transversely of the cavities, said cavities having internal spaced serrations adapted to engage a rod and said members having transverse slots at opposite sides of the cavities, reversely-arranged wedges received in slots from opposite sides of the body portions, and clamp bolts uniting the body members.

METHOD OF RECOVERING SOLUTIONS.—No. 870,289; Wilbur A. Hendryx, Denver, Colorado.



The method of recovering solutions which consists in introducing a liquid beneath a charge containing a solid and a solution, displacing the solution by the upward flow of such liquid and filtering and thereby withdrawing the displaced solution.

FUSE-HOLDER.—No. 870,531; Robert O. Grooms, Ottumwa, Iowa.



In a fuse-holder, a body-portion adapted to retain a fuse, self-contained means for keeping the holder in position in a drill-hole, and means for guiding the holder to its desired position, said means comprising a ferrule shaped to engage the body portion of the holder and straddle the fuse carried thereby.

The Traylor Concentrating Table.

The table-deck of the Traylor table is divided into two distinct parts; the feed end being absolutely level, both lengthwise, and crosswise, and remaining so at all times; the discharge end of the table is so constructed that it can be raised or lowered, working on an axis, which runs diagonally from a point near the feed-box across the table to the opposite corner. When in operation, the discharge end is raised an inch or two, or just enough to throw the concentrates, which are traveling along the riffles, off to their

in contact with any of the wooden part of the table-deck, thereby preventing warping.

The base upon which the table-deck operates is constructed entirely of steel and is itself braced by several diagonal steel cross-braces, making a rigid construction. The table-deck is supported above this base by a large number of flexible steel uprights which allow of the reciprocating motion of the table. The reason for employing such a large number of these steel upright supports is to make impossible any warping of the table-deck. On the Traylor table the concentrates are fed forward by the reciprocating motion toward the diagonal axis of adjustment, where they meet the slight inclination of that end or corner, and by this inclination their course is diverted to the launders at the discharge corner. Beginning at the diagonal axis of adjustment, and from there on toward the discharge end, the riffles become lower, until they almost disappear, thereby facilitating the diversion of the concentrates to their respective launders. The heavier concentrate climbs a little higher up on this slightly inclined end of the table, the lighter climbs not quite so far up, the middling still lower, while the sand is washed over the side, all being distinctly separated and falling in their respective launders.

Catalogues Received.

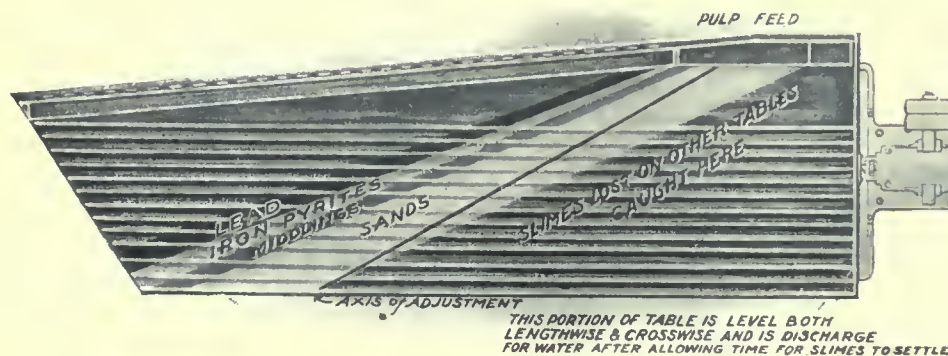
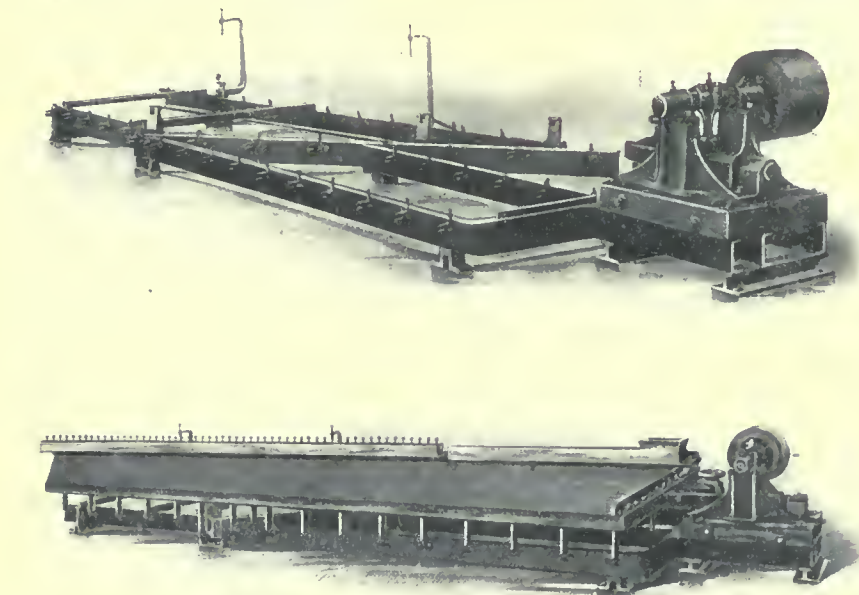
T. H. PROSKE, of Denver, Colorado, has just sent us his instructive catalogue describing the drill sharpeners and heating forges manufactured by him. In this catalogue of only 11 pages there is more information than in many catalogues of much larger size.

The AMERICAN GRONDAL KJELLIN CO., of New York, has just issued Bulletin No. 1, giving much valuable information regarding the magnetic concentration and the briquetting of iron ores. The Grondal Kjellin magnetic separators are much used in Sweden; in this catalogue are many good cuts illustrating their process in use in that country. No binder is used in their system of briquetting.

Publications Received.

'Merck's 1907 Index,' 472 pp., cloth bound, Merck & Co., New York City. This book is issued for distribution to users of chemicals upon receipt of 25 cents. It is a trade publication, which contains much valuable information concerning drugs and chemicals. In it are given the names, synonyms, physical form, and properties of different chemicals, together with their specific gravity, boiling or melting points, etc. It is a handy reference book.

We are in receipt of the following publications of the United States Geological Survey: Bulletin No. 277, 'Mineral Resources of Kenai Peninsula, Alaska,' by Fred H. Moffit and Ralph W. Stone; Bulletin No. 323, 'Experimental Work at the Chemical Laboratory of the United States Fuel-Testing Plant at St. Louis, Mo.,' by N. W. Lord; Bulletin No. 324, 'The San Francisco Earthquake and Fire,' 171 pp.; this is illustrated by many fine half-tones.



respective launders at the far corner of the discharge end and side of the table. On account of the feed end of the table being level, it prevents the water rushing straight across, carrying with it the slime and fine mineral, without allowing time to settle this valuable product. The riffles are in the shape of long regular waves, at an angle of 15°; they are cut into the wooden top of the table and become part of it, instead of being nailed down on the top. This prevents the continual trouble of renewing and repairing riffles. The corners on each of the riffles are filled in, and over all is placed a single piece of hard rubber, giving an absolutely smooth rolling surface without any cracks or shape corners. A smooth rubber surface has a greater tendency to adhere to and hold minerals than is the case on any other smooth surface material. The rubber, covering the entire top of the table, also prevents the water coming

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TABLE OF CONTENTS

Editorial:	Page.
Notes.....	693
Treatment of Siliceous Ore.....	694
The Presidential Message.....	695
By the Way.....	696
General Mining News.....	698
Special Correspondence.....	702
Johannesburg, Transvaal.....	Ptoche, Nevada
Denver, Colorado.....	Butte, Montana
Salt Lake, Utah.....	Cripple Creek, Colorado
Mexico	
Concentrates.....	708
Discussion:	
Cyanidation of Ore Containing Both Coarse and Fine Gold.....	<i>Viator, Philip Argall</i> 709
Questions by a Practical Miner.....	<i>H. C. C.</i> 710
Wall Street.....	<i>A. G. McLaughlin</i> 710
Articles:	
Measuring Industrial Temperatures.....	<i>Thomas T. Read</i> 712
Slime Treatment.....	<i>Askin M. Nicholas</i> 715
The Burt Rapid Cyanide Filter.....	<i>E. Burt</i> 717
Electric Zinc Smelting.....	<i>Frederick T. Snyder</i> 720
Mining and Metallurgical Patents.....	721
The Prospector.....	719
Departments:	
Personal.....	697
Obituary.....	697
Market Reports.....	697
Books Received.....	722
Publications Received.....	722
Commercial Paragraphs.....	722
Catalogues Received.....	722

Editorial.

IN OUR ISSUE of November 16 we referred to the proposed abrogation of assessment work on mining claims and we are glad to note that most of the periodicals devoted to mining interests have expressed concurrence with our opinion that such legislative action is unnecessary and likely to prove harmful. The cloven hoof of the spoofer has been detected in this proposal and it is not likely that the bid for cheap notoriety on the part of a certain congressman will prove effective. The real miner is willing to do his assessment work; currency may be scarce, but bacon and beans are plentiful as of old, and no man's credit is as good as that of the prospector.

AT THE PRESENT time 14,500 barrels of cement are being made daily in California and the existing works expect to increase this production to 29,000 barrels per day. Domestic cement is worth \$1.65, and the imported \$3.15, per barrel. The rebuilding of San Francisco and the wider use of reenforced concrete has stimulated the manufacture of cement. The price is likely to become 75 cents to \$1 per barrel for domestic, the quality of which is not as uniformly good as that imported from Germany and England.

ON ANOTHER PAGE we submit a query concerning the cyanide treatment of an ore containing gold both in a coarse and in a fine state of subdivision. It was first presented by a well-known cyanide specialist, who visited San Francisco on his way from South Africa to Mexico. By our request, he prepared the communication to which he now appends the non-committal signature of 'Viator.' We have submitted the problem to several acknowledged leaders in cyanidation and this week we publish the first of the answers. The discussion by Mr. Philip Argall needs no recommendation and we hope that it may lead to a ventilation of practical ideas.

THE LETTER from Mr. A. G. McLaughlin on the subject of 'Wall Street' presents a point of view at variance with the observations made in these columns recently, and for this very reason we are glad to publish his communication. Wall Street needs defenders just at this time and it is fair to say that Mr. McLaughlin makes a good case for the financial centre. In his analysis of the banking situation he is correct, and his explanation of the dominant position of New York as the great security market of America is well stated. As for the rest of the argument, it is that of one who idealises the character of the transactions constituting the larger part of the business of 'the Street.' If brokers themselves did not speculate, if 'wash sales' were a figment of the imagination, if 'puts' and 'calls' were non-existent, if balancing a win against a bankruptcy were

unknown, if bankers did not join hands with brokers, if directors were not speculators in stocks of their own companies, if these and sundry other objectionable practices were no part of the daily fuss and fume of Wall Street, then indeed Mr. McLaughlin's appeal to fair play would make us ashamed of joining populist orators and the great disgruntled in a destructive criticism of the casino on Manhattan island.

IN A FORMER issue mention was made of the absence of rabbits in Western Australia, because the wild-cats of the mining camps had prevented the invasion of a pest so injurious to the other Australian States. Now we learn that during the last few years—since 1900—the rabbits have come in swarms and the Government estimates that 2,000 miles of wire-net fence has been constructed, at a cost of £200,000. So far the fence has proved an effective barrier; the agricultural area has not been invaded, but in the mining districts of the desert the rabbits are to be seen in great numbers; but the miners say that fresh rabbit is better than 'tinned dog,' the vernacular for canned meat. All of which goes to show that the wild-cat has been tamed and no longer serves to defend Western Australia from the South Australian rodents.

IT IS SAID to be the avowed practice of one of the biggest industrial corporations in the country to use any metallurgical method that it may see fit to adopt in the making of iron and steel, leaving it to the patentee to bring suit. If he makes a good case, the corporation purchases the patent; if not, the use of it is continued without further recognition of the patentee's rights. The argument is that a patent must undergo the baptism of litigation before its validity is assured. When the higher courts have given it the stamp of authenticity, it is time enough to pay a royalty or to buy exclusive rights in the invention. This frank piracy is not commended, it is only mentioned as a fact. We are prompted to speak of it by the letter of Mr. Askin M. Nicholas, appearing in our issue of November 9, and by the transcript of his patent specifications, as given on another page of the present issue. He wrote to us from Australia, claiming the originality of a type of filter-press now successfully applied in cyanide mills. Mr. Nicholas was unsuccessful in getting his device introduced, and after spending more money than he could afford, he dropped the business. Now that the idea has been applied, with improvements, by others, all he asks is the recognition due to the inventor of a useful machine. Incidentally, he transmits a bit of advice from the southern side of the equator, warning other inventors to get the service of a thoroughly reliable patent lawyer, if ever they expect to make money from their patents. With the spirit of his communication there is no fault to find and our cyanide specialists will be glad to accord him the honor he deserves. For our part we believe that a patentee strengthens his claim to a royalty when he also can advise as to how the invention is to be applied. The mere devising of a scheme or a machine fulfills only a part of the usefulness of the invention.

Treatment of Silicious Ore.

TALK of starting new smelters at Reno and elsewhere has been provoked by the difficulty in getting prompt settlements from the smelters; but such talk is not to be taken seriously. The 300 tons of high-grade silicious ore available daily from the Goldfield mines would form an inadequate basis for any smelting operation and while the copper ores occurring in the same region might be used in making a suitable mixture, this would not hasten realization on the silicious output, for the matte to be formed would have to be first converted and then refined, and this would be accomplished with no greater celerity by one smelting establishment than by another. Eventually we hope to see the Tonopah and Goldfield districts united by rail to Ely, and then the big plant of the Nevada Consolidated in the Steptoe valley would furnish a market for silicious material, to be mixed with the pyritic ore of Ely. Of course, the wild statements as to an attempt on the part of the Guggenheims or their associates to get control of the gold mines in Nevada by refusing smelter facilities and thereby depressing stock quotations, are hardly worth notice. We hold no brief for them, but it is fairly obvious that they have bitten as much as they can comfortably assimilate and no group is less likely to be buying mines at this time. As a matter of fact, at the back of the talk about a disorganized ore market there is the recognition of a necessity for improving labor conditions, which, at Goldfield, have been out of hand for a long time. Furthermore, the lessees have left some of the mine workings in bad order and a little interval permitting of re-timbering and other repairs will be welcomed by the managers. In the meanwhile the differences between the mine owners and the Western Federation of Miners have reached an acute stage, and we hope that it will be adjusted in such a way as to prevent any further interference on the part of avowed anarchists with the progress of an important industry. Unions we shall have, and they serve a purpose as useful as corporations, but lawless organizations of either labor or capital ought not to be able to persist.

But this problem of treating high-grade silicious ores will solve itself. In every camp the growth of mining and the development of individual mines leads to a lowering of the assay-value of the average output. Cripple Creek and Kalgoorlie, the two great gold-fields of the last decade, were high-grade camps during their early years. Cripple Creek shipped its rich silicious material to the Denver and Pueblo smelters, while at Kalgoorlie the mills extracted the gold at a cost not a bit less than the usual smelter rate. In the course of time some of the high-grade orebodies were exhausted, and the output became less rich, per ton, simply because a general cheapening of operations enabled the managers to exploit orebodies formerly unprofitable, and to mix the poorer stuff with what remained of the bonanzas. As much profit was made on medium-grade ore as was made in the early stages of mining from the high-grade product. At Goldfield the bonanzas yet remain, in large part, but the steady

improvement in methods of mining and milling will gradually eliminate the smelter problem. Cyanidation on the spot will follow in the wake of smelting at a distance. History repeats itself.

The Presidential Message.

THE MESSAGE of the President to the Congress of the United States claims more than the usual attention given to Mr. Roosevelt's utterances and it will be found in accord with the general trend of his policy. We reproduce a part of the message on another page. Discussions concerning interstate commerce and the currency problem constitute the most important features of this document. Again the President essays to define the difference between honest corporations and predatory monopolies, again he undertakes to draw an effective contrast between the energetic useful citizen and the lawless malefactor of the business world, and if, as in most differentiations of the kind, the line between the ethically good and bad is not finally drawn, simply because such demarkations are confused by the factor of motive, nevertheless most of us will recognize the essential truth of his statements and the even more obvious patriotic purpose that prompts the utterance of them. It is his hope so to guide legislation that the country may curb the excesses of an industrial civilization and avoid the dangers imminent upon an unrestrained license in business competition. We see in his attitude as a statesman the expression of an aroused public opinion, aware at last that even national prosperity can prove too costly, if it is to allow a handful of unscrupulous men to control the basic industries of production and transportation. The only regret that, as an entirely non-partisan journal, we feel at this juncture, is that the discussion of methods for bettering business conditions should be hampered by party ties, for the question of the tariff is one that, as an astute politician, Mr. Roosevelt avoids. It ought to be frankly discussed in any fundamental effort to restrict the rapacity of monopolies and the corruption of business.

However, that is dangerous ground for a technical periodical, so we pass on to two other matters. The first of these is the repeal of the tariff on wood pulp; this had already been advocated by Mr. Bryan, himself a publisher, and it seems proper that it should be recommended by another author of exuberant verbosity. It is known to our readers that the wood pulp used in the manufacture of paper has become dear, partly owing to the paper trust, and partly by reason of the depletion of the timber from which such pulp is made. It is desired to remove the duty on this commodity as imported from Canada, and it is hoped that Canada will not retaliate with an export duty. As stated on a previous occasion, we see no need for a special policy in this matter, for the cheapening of print paper is in no way likely to be contributory to the industrial well-being or intellectual development of the country, since it means chiefly that greater facilities will be afforded for the publication of the voluminous drivel of blanket newspapers, devoted

mainly to the narration of things that never happened, to the vulgar description of trivialities, and the weary elaboration of bestialities, to which is annexed a negligible quantity of wishy-washy comment, prepared by underpaid and half-educated scribblers. We want fewer papers and a higher standard; less paper and more ideas; less printing and more honesty of purpose. So let the wood stay in the forests of Canada until such time as it can be used to beneficent purpose. There is enough of it in the United States to serve the needs of the dozen real newspapers that actually guide and illuminate public opinion.

Another interesting subject that finds a place in the President's message is the Bureau of Mines, the creation of which is recommended. This recognizes the demands presented for several years past by the American Mining Congress. It had been hoped by some that a Department of Mines, with its Secretary as a member of the Cabinet, would be created, but if this cannot be done, the mining community will be glad to see the organization of a Bureau of Mines, the chief duties of which will be the collection of statistics, the devising of methods to decrease accidents in mines, the prevention of fraud in connection with company promotions, and the mapping of mining districts. Two of these duties are now performed by the Geological Survey, and it will be a nice question as to how the new bureau will be related to the Survey. Will it be co-ordinated or subordinated? We expect that in the perfectly proper anxiety to preserve the importance and usefulness of the Geological Survey, the friends of that bureau will endeavor to place the new Bureau of Mines under the administration of the Director of the Survey or that the mining organization will be subordinated to the older geological branch. That would be regrettable, if it should further dilute the character of the Survey as a special scientific corps or scatter the energies of its able chief. The mining and the geological branches ought to be co-ordinate, but independent, and they ought to constitute the two parts of a mining department having for its head a man capable of supervising the operations of both. At the present time the Director of the Survey is accountable to the Secretary of the Interior, although as a matter of fact the Secretary of Commerce and Labor is more likely to be in touch with the mining industry. It is proposed to put the Bureau of Mines in the Department of the Interior and this suggests the recognition of geological primogeniture. In any event, we hope that in the effort to make a new departure of uncertain value, nothing will be done calculated to impair the usefulness of an established organization of such unquestioned help to mining development as the Geological Survey. Let us have a Bureau, or a Department of Mines, as may seem best, but let it not further emasculate a technological body, the products of which have done honor to the American application of science to industry. In these matters the President is necessarily guided by specialists and we hope that any considerations of political expediency will not be permitted to over-ride the real necessities of the case.

By the Way.

In his message to the Congress, the President said:

"In any large body of men there are certain to be some who are dishonest, and if the conditions are such that these men prosper or commit their misdeeds with impunity, their example is a very evil thing for the community. Where these men are business men of great sagacity and of temperament both unscrupulous and reckless, and where the conditions are such that they act without supervision or control, and at first without effective check from public opinion, they delude many innocent people into making investments or embarking in kinds of business that are really unsound. When the misdeeds of these successfully dishonest men are discovered, suffering comes, not only upon them, but upon the innocent men whom they have misled. It is a painful awakening whenever it occurs, and naturally when it does occur those who suffer are apt to forget that the longer it was deferred the more painful it would be. In the effort to punish the guilty it is both wise and proper to endeavor so far as possible to minimize the distress of those who have been misled by the guilty. Yet it is not possible to refrain because of such distress from striving to put an end to the misdeeds that are the ultimate causes of the suffering, and as a means to this end, where possible, to punish those responsible for them. There may be honest differences of opinion as to many governmental policies, but surely there can be no such differences as to the need of unflinching perseverance in the war against successful dishonesty.

"In my message of December 5, 1905, I said:

"If the folly of man mars the general well being, then those who are innocent of the folly will have to pay part of the penalty incurred by those who are guilty of the folly. A panic brought on by the speculative folly of part of the business community would hurt the whole business community, but such stoppage of welfare, though it might be severe, would not be lasting. In the long run the one vital factor in the permanent prosperity of the country is the high individual character of the average American worker, the average American citizen, no matter whether his work be mental or manual, whether he be farmer or wage worker, business man or professional man.

"In our industrial and social system the interests of all men are so closely intertwined that in the immense majority of cases a straight dealing man who by his efficiency, by his ingenuity and industry, benefits himself must also benefit others. Normally the man of great productive capacity who becomes rich by guiding the labor of many other men does so by enabling them to produce more than they could produce without his guidance, and both he and they share in the benefit, which comes also to the public at large. The superficial fact that the sharing may be unequal must never blind us to the underlying fact that there is this sharing and that the benefit comes in some degree to each man concerned. Normally the wage worker, the man of small means and the average consumer, as well as the average producer, are all alike helped by making conditions such that the man of exceptional business ability receives an exceptional reward for his ability. Something can be done by legislation to help the general prosperity, but no such help of a permanently beneficial character can be given to the less able and less fortunate save as the results of a policy which shall inure to the advantage of all industrious and efficient people who act decently, and this is only another way of saying that any benefit which comes to the less able and less fortunate must of necessity come even more to the more able and more fortunate. If, therefore, the

less fortunate man is moved by envy of his more fortunate brother to strike at the conditions under which they have both, though unequally, prospered, the result will assuredly be that while damage may come to the one struck at, it will visit with an even heavier load the one who strikes the blow. Taken as a whole, we must all go up or down together.

"Yet, while not merely admitting, but insisting upon this, it is also true that where there is no governmental restraint or supervision, some of the exceptional men use their energies, not in ways that are for the common good, but in ways which tell against this common good. The fortunes amassed through corporate organization are now so large and vest such power in those that wield them as to make it a matter of necessity to give to the sovereign—that is, to the Government, which represents the people as a whole—some effective power of supervision over their corporate use. In order to insure a healthily social and industrial life, every big corporation should be held responsible by and be accountable to some sovereign strong enough to control its conduct. I am in no sense hostile to corporations. This is an age of combination, and any effort to prevent all combination will be not only useless, but in the end vicious, because of the contempt for law which the failure to enforce law inevitably produces. We should, moreover, recognize in cordial and ample fashion the immense good effected by corporate agencies in a country such as ours, and the wealth of intellect, energy, and fidelity devoted to their service, and therefore normally to the service of the public, by their officers and directors. The corporation has come to stay, just as the trade union has come to stay. Each can do and has done great good. Each should be favored so long as it does good. But each should be sharply checked where it acts against law and justice.

"The makers of our national constitution provided especially that the regulation of interstate commerce should come within the sphere of the general Government. The arguments in favor of their taking this stand were even then overwhelming. But they are far stronger today, in view of the enormous development of great business agencies, usually corporate in form. Experience has shown conclusively that it is useless to try to get any adequate regulation and supervision of these great corporations by State action. Such regulation and supervision can only be effectively exercised by a sovereign whose jurisdiction is coextensive with the field of work of the corporations—that is, by the national Government. I believe that this regulation and supervision can be obtained by an enactment of law by the Congress. * * * Our steady aim should be by legislation, cautiously and carefully undertaken, but resolutely persevered in, to assert the sovereignty of the national Government by affirmative action.

"It has been a misfortune that the national laws on this subject have hitherto been of a negative or prohibitive rather than an affirmative kind, and still more that they have in part sought to prohibit what could not be effectively prohibited, and have in part in their prohibitions confounded what should be allowed and what should not be allowed. It is generally useless to try to prohibit all restraint on competition, whether this restraint be reasonable or unreasonable; and where it is not useless it is generally hurtful. * * * The successful prosecution of one device to evade the law immediately develops another device to accomplish the same purpose. What is needed is not sweeping prohibition of every arrangement, good or bad, which may tend to restrict competition, but such adequate supervision and regulation as will prevent any restriction of competition from being to the detriment of the public."

Personal.

H. A. TITCOMB is in Chile.
C. W. PURINGTON is at London.
HENRY KRUMH is at Mohawk, Arizona.
MARK L. REQUA has returned from New York.
T. BRUCE MARRIOTT is on his way to British Columbia
C. BOETTCHER, of Denver, is in San Francisco for a few days.
T. A. RICKARD spent a few days at Santa Barbara last week.
ARTHUR W. GEIGER is in this City, on a visit from Elko, Nevada.
OSCAR H. HERSHEY is inspecting a mine near Yucca, Arizona.
ALVIN BACON CARPENTER, of Mexico City, is in San Francisco.
DWIGHT FURNESS has resigned as American Consular Agent at Guanajuato.
E. R. ABADIE has returned to Oakland from his mine in Tuolumne county, California.
ARTHUR L. PEARSE sailed on the *Mauretania* on November 30 on his way to London.
J. PARKE CHANNING has returned to New York from a six months' trip in the Northwest.
JOHN C. MCMYNN has resigned his connection with Robert W. Hunt & Co. of Chicago.
C. COLCOCK JONES has returned to Los Angeles from an examination of mines near Congress, Arizona.
A. C. BEATTY, on his return from Mexico and Arizona, met JOHN HAYS HAMMOND at Santa Barbara.
GEORGE WILLIAMS is superintending the construction of the new ore-bins at the Tyee smelter, Ladysmith, B. C.
A. C. REDDING, of Smith, Emery & Co., has returned from a journey in San Bernardino county and northern Mexico.
G. M. GOUYARD of Denver has moved to New York. He will have his office with the Douglas Copper Company, 42 Broadway.
J. J. SMITH, president of the San Xavier Copper Co., Chicago, was recently at Fundicion on his way to his property in the same district.
WALTER J. BROWNING has been appointed general manager of the Rio Tinto Copper mine, in Spain, and leaves for Europe shortly.
JNO. M. BROOKS, JR., Asst. Supt. Compañia Metalurgica y Refinadora del Pacifico, at Fundicion, Sonora, has returned from a vacation in the States.
WILLIAM H. LINNEY, until recently manager of the Nipissing mine at Cobalt, passed through San Francisco this week on his way to Pasadena.
E. A. H. TAYS has resigned the position of general manager for the United Mining Co. of New York and is now in no way connected with that company. He has left Denver for San Blas, in Sinaloa, Mexico.

Obituary.

CHARLES A. MOLSON, one of the best mining engineers in America, died on November 26, at Rea, in Idaho. His death was due to a gun accident while shooting duck and, as no one was present, it is supposed that an accidental discharge of his own gun was the cause of the fatality. He was born at Montreal 45 years ago, and was graduated, with honors, from McGill University. His professional career began in Colorado, where he was employed by the Pueblo Smelting & Refining Co. From Colorado, several years later, he went to Montana, and was with the Granite Mtn. Mining Co. at Phillipsburg. His first important management was that of the Elkhorn mine, also in Montana, where he won a reputation for ability and integrity. This led to his being engaged by the Exploration Company, of London, as

their representative at Salt Lake. For the past ten years he served as an advisory engineer to this important mining corporation, besides doing independent work as a consulting engineer. The sudden death of an engineer so generally liked and respected will come as a sad blow to many members of the profession.

Latest Market Reports.

LOCAL METAL PRICES—Dec. 5.

Antimony.....	13@17c	Quicksilver (flask).....	\$45.50
Casting Copper.....	18@19c	Spelter.....	7@ 7.75c
Pig Lead.....	4.50@ 5.45c	Tin.....	39½@41c

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.

Date	Electrolytic Copper	Lead	Spelter	Silver
Nov. 29.....	13½	4.10	4.60	57¼
" 30.....	13½	4.05	4.55	57½
Dec. 1.....	Sunday. No market.			
" 2.....	13½	4.05	4.50	57¼
" 3.....	13½	4.05	4.45	57¼
" 4.....	13½	4.05	4.43	57½

ANGLO-AMERICAN SHARES.

Cabled from London.

	Nov. 27.	Dec. 5.
	£. s. d.	£. s. d.
Camp Bird.....	0 15 6	0 14 0
El Oro.....	1 1 3	1 2 0
Esperanza.....	1 10 3	1 9 6
Dolores.....	1 0 0	1 0 0
Oroville Dredging.....	0 14 3	0 14 3
Stratton's Independence.....	0 2 9	0 2 9
Tomboy.....	1 9 3	1 10 6

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

MINING STOCK QUOTATIONS—NEW YORK.

Closing Prices.

	Nov. 27.	Dec. 4.
Bingham Central.....	1¼	1½
Boston Copper.....	10	10½
Cumberland Ely.....	5	5¼
Dolores.....	5	5¼
El Rayo.....	1¼	1½
Guanajuato Con.....	2½	2½
Giroux Con.....	2¼	3
Nevada Con.....	7¼	7½
Nipissing.....	5½	6
Tennessee Copper.....	26	26½
Tonopah Ex.....	1¼	.....
Tonopah-Helmont.....	1	.....
Tonopah.....	6¼	6¼
United Copper.....	7	7¼
Utah Copper.....	15¼	17½

(By courtesy of Hayden, Stone & Co., 25 Broad St., New York.)

COPPER SHARES—BOSTON.

Closing prices.

Closing prices.

	Dec. 5.		Dec. 5.
Adventure.....	1¾	Michigan.....	8¼
Ahmeek.....	50	Mohawk.....	49
Allouez.....	27½	Nevada Con.....	7½
Amalgamated.....	49¾	North Butte.....	40¾
Areadian.....	4¼	Old Dominion.....	27½
Atlantic.....	9¾	Osceola.....	85
Bakaklala.....	2½	Parrot.....	10
Bingham Con.....	4¼	Phoenix.....	75
Boston Con.....	10¼	Quincy.....	79
Butte Coalition.....	15	Raven.....	90
Calumet & Arizona.....	98	Rhode Island.....	2¼
Calumet & Hecla.....	600	Santa Fe.....	17½
Centennial.....	26½	Shannon.....	10½
Con. Mercur.....	27	Superior & Pittsburg.....	87½
Copper Range.....	55	Tamarack.....	61
Daly-West.....	10¼	Trinity.....	15
Franklin.....	8	United Copper com.....	8
Granby.....	70	Utah Copper.....	16¾
Greene-Canaan, etc.....	5¼	Victoria.....	4¼
Isle Royale.....	17½	Winona.....	1
Mass.....	2½	Wolverine.....	110

Structural Material.

Base prices f. o. b. cars San Francisco.

Brick, common, per M.....	\$8.50
Cement, domestic, per bbl.....	\$1.90
Cement, foreign, per bbl.....	\$2.75@ 3.25
Firebrick, domestic, carload lots, per M.....	\$37.50
Firebrick, English.....	\$50@ 55
Lime, per bbl.....	\$1.15@ 1.25
Lumber, Ord. Dimension Stock, f. o. b. Gray's Harbor, per M.....	\$13@ 14
Mining timbers, f. o. b. Gray's Harbor, per M.....	\$12
Nails, per keg.....	\$3.25

General Mining News.

ARIZONA.

COCHISE COUNTY.

(Special Correspondence).—On the 12th of November gas was discovered coming from some old stopes on the 800-ft. level of the Gardiner mine of the Copper Queen. The gas had a peculiar alcoholic odor; this gas greatly hampered work, as it affected the miners greatly, in fact rendering a few unconscious in a very short time. Bulkheading was immediately resorted to in order to confine the gas to as small a portion of the mine as possible. On the 15th the gas began to make its way into the workings in the northeast portion of the Irish Mag mine of the Calumet & Arizona Co. The gas became very strong, but after three days it was successfully shut off by bulkheads. It then appeared in the Spray mine and only with great difficulty was shut off there. Up to the present time the cause of it is not known. It is reasonably certain, however, that it is a fire in one of the old stopes of the Copper Queen Co. near the northeast end of the Irish Mag property of the Calumet & Arizona Co. There has been very little stoping done in this ground for over 18 months, it having been practically worked out two years ago. At the present time no effort is being made to put out this fire. It has been shut in on all sides by bulkheads and is not affecting any of the other portions of either the Copper Queen or Calumet & Arizona mines.—A fire started at the Shattuck-Arizona mine Dec. 19. One of the men going to work noticed smoke issuing from the collar of the shaft. He immediately turned in an alarm. The smoke was so thick that it was impossible to go down the shaft or to reach it from the Cuprite mine, which is connected with the 800-ft. level of the Shattuck. After running water down the shaft for several hours, the shaft as well as the drift connecting with the Cuprite mine was bulkheaded and made air-tight. Both these openings were left sealed for several days, after which entrance was made. It was found that the fire had been on the 800-ft. station; the damage is reported as not to exceed \$1,200.—On account of the present stringency in the money market, Bisbee has adopted the Clearing House system. The Copper Queen, the Calumet & Arizona, and the Superior & Pittsburg companies, instead of paying by the usual check, are giving drafts drawn on New York in denominations of \$5, \$20, \$10, and \$5 made payable to bearer, and are issuing a local check (not exceeding \$5) for the balance.—The only mines in the district now operating are those belonging to the Copper Queen, Calumet & Arizona, and Superior & Pittsburg companies. The Denn and Shattuck companies were the last to close down, the latter on account of the refusal of the Old Dominion and Copper Queen smelters to handle custom ore. There have been persistent rumors to the effect that there will be a change of management at these two properties.

Bisbee, Dec. 1.

COCHISE COUNTY.

The Lucky Cuss shaft-house burned Nov. 28. The fire was put out before it had extended down the shaft to any extent. The shaft-timbers were charred for a distance of 50 ft., but no damage had been done on the 100-ft. level. The fire is supposed to have started in the change-room, which forms part of the shaft-house. The old hoist, which was used in the palmy days of Tombstone, was completely destroyed.—The meeting of the directors of the Calumet & Arizona Co., which was to be held Nov. 23, was postponed until Nov. 30. During the year this company has purchased mineral land outside the Warren district; these properties have been paid for out of money in the treasury. On at least one of the new properties ore of good quality has been found, and apparently it will develop into a mine.—Several silver and lead properties are being developed near Paradise. The Leadville mine has shipped several carloads of rich lead-silver ore; the Hilltop, the King of Lead, and the Texas have also shipped some lead ore. There are two zones of lead mineralization. One extends from the Leadville mine near Paradise southerly to the Texas mine, a dis-

tance of a mile. This belt is quite wide. The other lead belt begins at the Hilltop and extends in a northerly direction to the King of Lead property.—The annual assessment work on the Scanland property is being done. The east drift from the adit is being extended. The adit is about 450 ft. long. The east drift leaves the adit near the face.

GILA COUNTY.

This week the force employed at the Old Dominion mine will be increased by 75 to 100 men. These miners will be put to work stoping sulphide ore from the lower levels of the mine. For almost the first time in the history of the Old Dominion company no ore is being received from outside camps. This has caused the resumption of mining in the sulphide orebodies, as formerly sulphide ore came largely from Cananea and Bisbee. Considerable concentrate, which was shipped from Cananea before the shut-down, is still on hand, but this will soon be exhausted. The smelter produced approximately 2,700,000 lb. of blister copper during November, of this amount 2,000,000 lb. was reduced from Old Dominion ore. At the mine development work during the week has been quite satisfactory, although a flow of water delayed the work in the cross-cut on the 16th level. A pump has been installed and driving for the sulphide orebody has been resumed.—At the Mallory shaft of the Globe Consolidated, the cross-cut from the bottom of the shaft is now 140 ft. long and is expected to cut within the next 10 ft. the vein prospecting on the 460-ft. level. On that level considerable of the ore had been leached, but portions assayed as high as 7% copper. At the Gem shaft they have begun to cut the station at the 1,200-ft. level, but it is not expected that cross-cutting on that level will begin before Jan. 1.—At the Great Eastern shaft of the Superior & Boston Co., the north cross-cut on the 426-ft. level (the same as the Black Hawk 500-ft. level) is now 200 ft. long, but it will have to be driven about 200 ft. farther before it cuts the Black Hawk vein.—The shaft at the Black Hawk property of the Arizona Commercial Co. is now 80 ft. deep.—The directors of the Lake Superior & Arizona Co. have decided not to resume at the property for some time.—The Globe Miners' Union, local No. 60, W. F. of M., has adopted a resolution, asking Mark Smith, the Arizona delegate to Congress, to oppose the proposed suspension of assessment work upon mining claims for the year 1907.—The case of the Old Dominion Co. v. A. S. Bigelow and Leonard Lewisohn has been decided in favor of the company and 20,000 of the 50,000 shares given to the promoters will be returned to the company treasury.

CALIFORNIA.

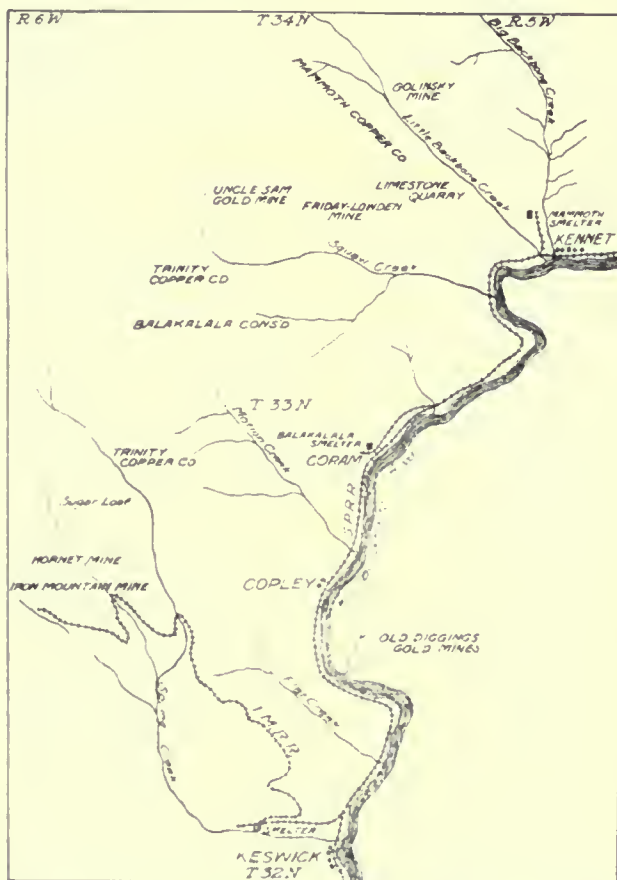
AMADOR COUNTY.

At the Fremont Consolidated mine, near Drytown, a disastrous fire started at noon of the 30th; when the men were lowered at one o'clock the skip stuck at the 1,000-ft. level. Two of the men managed to climb to the surface, but eleven others are still in the mine; four of these men are American, five Italians, and two Austrians. It is thought that the skip was thrown off by the body of one of the miners, rendered unconscious by the smoke. The skip could not be lowered or raised. Great volumes of smoke came from the shaft immediately. Unsuccessful attempts were made to get into the mine from the Gover shaft, which is several hundred feet from the Fremont, and is connected with it on the 700-ft. level. Owing to the smoke it was impossible to effect an entrance that way. On the 2nd, Mr. Goodall, the manager, with several picked miners, penetrated as far as the 600-ft. level, but were overcome with gas, and had to be hoisted again. On the 3rd the fire was under control, but it was impossible to get below the 300-ft. level; it is thought that the shaft has caved at that point.—At the South Eureka mine 40 men are working. Some good ore was recently found on the 2,500-ft. level, but its extent is not known as yet. At the mill for the last six weeks all the stamps have been run only during the day-shift.—Only a few miners are working at the Central Eureka; these are taking out a pillar of rich ore from one of the stopes. A stockholders' meeting of the Central Eureka mine was held a few days ago in San Francisco; this is the

first meeting for 20 years. It seems probable that negotiations will be made with Hettie Green, and that the ground between the South and Central Eureka mines will be prospected.

NEVADA COUNTY.

One of the finest restraining dams in California has just been completed across Greenhorn creek, about a mile above the Narrow Gauge crossing; this is a cribbed dam, 30 ft. wide at the base, 25 ft. high, and 106 ft. long. Work began about three months ago. It will be used to impound the tailing coming from the Nevada hydraulic mine. This mine is mainly owned by J. S. Goodwin of You Bet and the Nichols family of Dutch Flat. The dam will back up the creek for half a mile. The dam has been planned so that it can be built to a height of 75 ft., at which height the creek would flow across a side ridge into another canyon. There is a large amount of good ground in the Nevada property. The pipe-line has been laid to the mine and everything is ready for piping to begin as soon as the winter rains set in.—At the Belle Union mine the adit, which has been driven



Map of the Copper Region of Shasta County, California.

from the open-cut, is now 40 ft. long. This mine is owned mainly by Sacramento and local people.—Wheeler & Gill are driving an adit to the north of the Belle Union to the same vein which was also worked long ago at that point. Both these properties are near Southern's mill and not far from Grass Valley.—The Kenosha mine has been unwatered.—The vein in the bottom of the mine is very promising. Sinking will begin at once; stoping will also commence soon.—George Mainhart of Grass Valley is the new superintendent of the Champion mines. James Moore will stay as foreman of the Champion. Over 100 men are working at the Champion and Home mines; 70 stamps are running at the mill.—A new pay-shoot has been found at the Banner mine. This ore was found on the 900-ft. level. Some time ago, owing to the financial stringency, the miners were laid off; recently Mr. Ball, the superintendent, has been doing some prospecting himself. It was he who blasted into the new orebody. This vein is of good size and is thought to be the continuation of the shoot which paid so well in the upper levels.

PLUMAS COUNTY.

Some rich ore has recently been found at the property of the Antelope Gold M. Co., on Antelope creek, near Clio. On the eight claims of this property there are three veins, the Antelope, the New Ledge, and Hawkeye. The centre vein, the New Ledge, outcrops for a distance of 1,500 ft. In the shaft on the Antelope, the vein, at a depth of 75 ft., is 4 ft. wide, and carries gold, silver, and copper. The Hawkeye vein is 9 ft. wide at the bottom of the shaft, which is 66 ft. deep. The cross-cut adit is now 265 ft. long; it is expected to cut the Antelope vein at a distance of 645 ft. The adit driven to intercept the Hawkeye cut that vein at a distance of 75 ft. from the portal.

SHASTA COUNTY.

At the Mammoth smelter No. 4 furnace will be in operation in about two weeks. The new stack has been completed. A. F. Holden, president of the United States company, the parent corporation controlling the Mammoth Copper Co., states that there is no intention of closing the Mammoth smelter.—The Noble Electric Steel Co., operating at Heroult, has bought the Mount Shasta, the Shotgun, and the Shotgun No. 2 claims on Shotgun creek, also the Carisbrook and the Chrome No. 1 and No. 2 claims; these contain bodies of chrome-iron ore.—At the Gladstone mine, near French Gulch, from 1,800 to 1,900 tons of ore are being treated in the mill each month; the ore is said to assay \$15 per ton. This summer the orebody on the 400-ft. level has been found and now the ore-bins are all kept full—quite a contrast to conditions last spring when the company was hunting for the orebody on the 300-ft. level. About 70 men are working at the mine.—The Milkmaid mine is shipping 2½ tons per day to the Selby smelter. This ore is quite high-grade. About 20 men are working at the mine. The vein is small but the ore is quite rich.—Frank N. Leland, who has just bought the Washington mine, has already started work at the mine.—The electric furnaces at Heroult started up Monday for the production of ferro-silicon, and it is expected that operations will be continued indefinitely. Production at Heroult has been suspended temporarily, owing to the necessity of getting all the power company's transmission lines in order for the winter season, and now that this has been accomplished the high voltage required at Heroult will again be turned on and continued without interruption. The steel cells for the battery of charcoal furnaces to be installed at the electric smelter are in process of construction. In all, fourteen are to be erected. They are to be of the latest design for the extraction of all of the by-products to be obtained from the distillation of wood. The magnitude of the charcoal industry to be created by electric smelting operations on the Pit can be conjectured from the statement that upward of 30,000 cords of wood will be used in a year.—The Keswick plant of the Mountain Copper Co. closed down last week.

SIERRA COUNTY.

The town of Alleghany is greatly excited over the discovery of very rich ore in the old Deep Blue gravel mine at Smith's Flat on the road to the Oriental mine. The ledge is five feet wide; the ore is quartz with gold-bearing arsenopyrite scattered through it and here and there flakes of free gold.

YUBA COUNTY.

At the Mt. Pleasant mine near Camptonville, some rich gravel has been worked during the last few weeks; nuggets weighing from one to five ounces have been found on the bed-rock. The Mt. Pleasant mine adjoins the Orient mine which is owned by North San Juan people. The Orient has just been bonded to an Oakland company; Oscar Jones is in charge of the work at the Orient.—Rich gravel has also been found at the Indian Hill gravel mine which is in the same vicinity.—The adit at the property, near Weed's Point, belonging to C. L. Crane is expected to cut the channel within the next few days.

NEVADA.

ESMERALDA COUNTY.

The output from Goldfield district for the week ending Nov. 28 amounted to 3,570 tons of ore having an estimated

value of \$354,230. The Mohawk Combination lease shipped 2,144 tons; Mohawk, 143; Begole lease, 522; Rogers Goldfield Syndicate, 80; McCoy lease, 18; Florence Annex, 5; total shipments by rail, 2,914 tons. The Nevada Goldfield Reduction Works milled 143 tons of ore from the Mohawk mine; the Combination mill treated 425 tons; the Kinkad mill treated 90 tons.—Practically all of the shipping mines and mills of the district closed down Wednesday morning, owing to the refusal of the miners to take scrip for their wages; the Mohawk Combination, which has been the heaviest producer of the camp the past few weeks, suspended work on Monday, owing to a cave-in which made the workings unsafe; consequently, the production for the week is the lightest for the month. No hope is held out for the immediate opening of the mines, and it is probable that until the financial situation improves and the smelters are able to make prompt settlements for ores, the mines will stay closed. Again the mines of Goldfield are shut-down and not a shaft is working. Again the Miners' Union has invited trouble, by refusing to work on a very flimsy pretext.—At a meeting of the Miners' Union of Goldfield Tuesday night, it was voted that the miners of the district should not work for any company paying its employers in scrip, cashier's checks, or any other than coin or currency; and receiving no assurances from the mine operators that they could or would make any change in the scrip system, adopted by the banks of Goldfield, the miners struck and failed to appear for duty on any of the mines of the district on the following morning. In consequence, there is not a mine in camp at work, and not a lease of consequence. Before taking action, the miners had appointed a committee which met with a committee of the mine owners, and the question was thoroughly discussed from every view-point. The miners were shown that it was entirely impossible for the operators to pay in cash, as the cash was not obtainable. The committee, apparently convinced, reported to the Miners' Union but the report was not adopted and the committee continued, with the hope that some compromise might be effected. But the mine owners' committee had no alternative to offer; the operators were up against a wall, and when the committee from the union sought another interview they were told that it was useless. Thereupon the miners met Tuesday night and voted to strike. Since Tuesday, no effort has been made on either side to come to a settlement, and a dead-lock exists.—The Florence Goldfield M. Co. has declared a dividend of 10c. per share on the issued stock, payable Jan. 2. This will amount to \$105,000.—Owing to the present labor troubles the Goldfield Consolidated has decided to pass the December dividend.

All the trouble among the miners at Goldfield has been caused by about 300 men in that camp. The better class of miners does not attend the meetings of the union, and the state of unrest is maintained by the rabid minority. The people of Goldfield have now determined to have an open camp. Both union and non-union men may secure employment, but the employers have made up their minds that no non-union miner shall be kept from working or driven out of the camp. They are going to act soberly and decidedly before conditions get bad the way they did in Idaho and Colorado. If conditions do not change there will surely be suffering in Nevada this winter. The miners have nothing saved, and those out of work in Goldfield have no other big camps to go to and get work.—There are now about 6,600 mine-workers in Nevada; at Goldfield, nearly 3,000; Tonopah, 1,000; Ely, about 1,000; Yerington, 300; Bullfrog, 200; Manhattan, 200; some at Virginia City, and at the balance of the smaller camps about 500; the wages these men receive range at the different camps from \$3 to \$5, Goldfield being the only \$5 camp. That is more than the ordinary properties can afford to pay operatives. The Comstock in its palmiest days, with living higher than it is now in Goldfield, paid \$4 a day. That is what they pay in Tonopah. Miners in Tonopah say they would rather work there for \$4 than at Goldfield for \$5, because they are surer to be working enough more days to make up for the wages lost at Goldfield due to strikes. Many of the smaller camps are not union. Ely is an open camp. At Goldfield the men continued demanding more and more wages. Now the

owners have called a halt. The business cannot generally afford more than \$4 a day to the mine-workers. Men can live well in Nevada for from \$45 to \$75 a month for board and lodging.

NYE COUNTY.

The shipments from the Tonopah district for the week ending Nov. 28 amounted to 1,690 tons. The Tonopah Co. shipped 1,112 tons; Tonopah Extension, 87; Belmont, 154; Jim Butler, 68; Midway, 211; West End, 57. The Tonopah Co. sent 2,728, the Belmont Co. 1,180, and the Montana Tonopah Co. 1,100 tons to the mills. The total output of the Tonopah mines was 6,698 tons, of an estimated value (the shipping ore being valued at \$70 per ton and the milling ore at \$30 per ton) of \$268,540.—At the Tonopah Extension the north cross-cut on the 1,050-ft. level is progressing rapidly and the formation is improving daily, being the true lode porphyry of the district. Numerous stringers of ore have been cut in this cross-cut recently. The west drift of the 600-ft. level, on which work was recently resumed, is 600 ft. long; at that point the ledge shows a width of 10 ft. and carries good shipping ore. Stoping is progressing with very satisfactory results on the 500, 400, and 275-ft. levels. The usual tonnage of ore is being shipped.—The station on the 320-ft. level of the new shaft at the West End property has been completed. Sinking will begin next week. The usual tonnage of high-grade ore is being mined from the stopes on the 400-ft. level.

BRITISH COLUMBIA.

The following were the ore shipments from the mining districts of British Columbia for the past week: Boundary, 1,273 tons; Rossland, 6,407; east of Columbia river, 3,689; total, 11,369 tons.—The Waverly Hydraulic M. Co. declared a dividend of \$5.50 per share at the annual meeting of the stockholders at Barkerville. This is 50c. per share more than last year. The yardage moved was 27,200, of which 4,600 cu. yd. was from the Lost channel and 12,000 cu. yd. from the Grouse creek channel. The average value was a little less than 36c. per cu. yd. More than half the gold came from the Grouse creek channel, which is therefore richer than the other. While the cleanup was in progress a slide of bedrock amounting to 3,000 cu. yd. or more came down from the west rim of the east channel, covering a part of the uncleared ground, so that not all the gold was recovered this year from the season's piping on that channel. About 144 ft. of the old sluice flume was replaced by new boxes at the end of the season.—The Guggenheims are negotiating for the South Valley group of copper properties on the eastern shore of Howe sound. These claims are situated in South Valley, just over the divide from the famous Britannia group, on which so much money has been expended and which have lately paid good profits when operated on a large scale.—The Federal Mining, Smelting & Refining Co. has bonded the Tangier group, situated on Huxley island, off the east coast of Moresby island, the principal island of the group. The consideration is said to be \$300,000, with a 10% payment in cash on signing the papers; the balance in payments extending over a period of 18 months.—The Copper King group of three claims has been bonded to H. Wulffsohn and E. F. Girling of Vancouver. The properties adjoin the well-known Swede group, which is situated on the east coast of Moresby island, 40 miles from Jedway. The lead is stated to have a width of 125 ft.; much of the ore assays 3% copper and carries \$3 gold per ton. The orebody is quite similar to that on the adjacent Swede group, also recently bonded by the same people.—In spite of the closing down of so many mines and consequent shutting down of several smelters, the Tyee works at Ladysmith continued to keep running. From Prince of Wales island one mine operated by the Alaska Industrial Co. continues to ship ore steadily, and with supplies from the Tyee mine and other producers the smelter is kept in operation. The ore from the mine on Prince of Wales island is high-grade. The Tyee Copper Co. is making important improvements and additions to the smeltery. The chief of which are a wharf in Oyster bay, a long incline trestle from the wharf to the smelter, ore-bins on the wharf and about the sam-

pling works, machinery and plant for unloading ore from vessels and hauling it up to the high-level storage-bins, an extension of the power-house, and the installation of another steam boiler and an electric generator.—Frederic Keffer, in charge of the mines of the British Columbia Copper Co., and president of the Canadian Mining Institute, has written the various Western members suggesting that a Western branch be formed. He therefore requests that all Western members attend a meeting to be held at Nelson on Jan. 15, when steps will be taken to organize such a branch. A number of papers prepared for the regular meeting of the Institute will then be read.

BOUNDARY DISTRICT.

There have been no developments of moment in regard to the recent closing of the large copper producing mines and smelters of the Boundary for what is stated to be an indefinite period. The Granby smelter and the B. C. Copper Co.'s smelting furnaces were operated a few days till the valuable flue-dust and bottoms around the works was all cleaned up and turned into blister copper, but about the middle of this week both these plants were blown out entirely. What the next move will be cannot be ascertained from any source; but apparently the mines will not resume until the price of copper advances considerably.—Three men are now employed at the Cariboo-McKinney mine.—Not more than 20 men are now employed at the

EAST KOOTENAY DISTRICT.

The ore shipments from East Kootenay mines for the past week were as follows: St. Eugene, 485 tons; Sullivan, 600; North Star, 234; total, 1,319 tons.

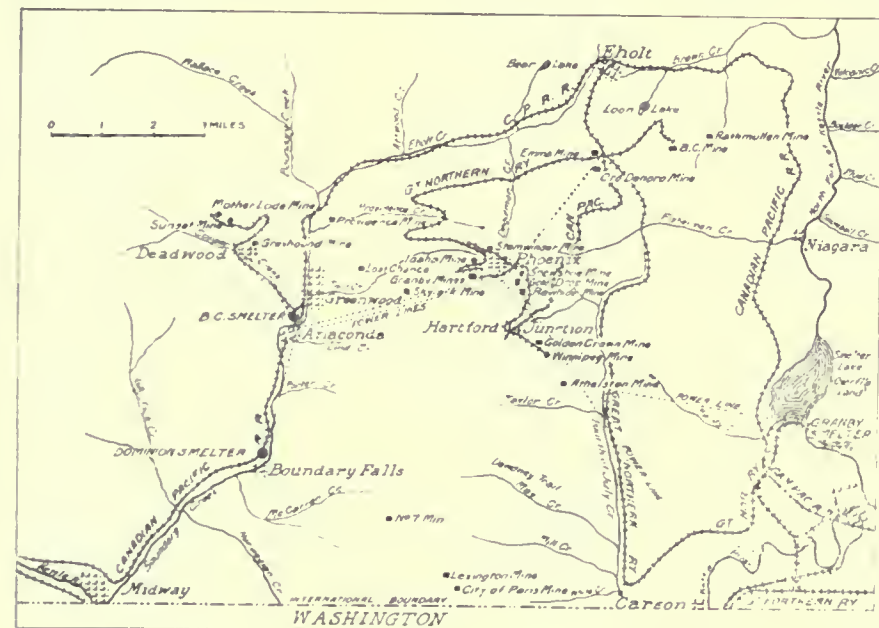
ROSSLAND DISTRICT.

The output of the Rossland district for the week ending November 23 was as follows: Centre Star, 4,120 tons; Le Roi, 3,115; Le Roi No. 2, 665; total, 7,900 tons. This makes a total for the year up to date of 248,114 tons. The Rossland Miners' Union, local No. 21, W. F. of M., voted on November 27 to voluntarily accept a reduction of the wages to those prevailing prior to July 1, when the wages were raised 50c. per day for all underground labor. In the future, machine-men will get \$3.50 and shovelers \$2.75. This voluntary reduction of the wages by the Union itself will result in the running of all the mines in spite of the fall in the price of lead and the other metals which has taken place recently. The vote was carried by a two-thirds majority. The output of the two larger mines has passed the 100,000-ton mark for the year to date, the Centre Star having shipped 118,235 tons and the Le Roi 100,385 tons. The shipments this year will fall considerably under last year's total, and will not nearly reach 300,000 tons. There are numerous causes for this, the most potent of which was the shortage of coke that prevailed during the larger portion of the year. It is certain that, if the supply of coke had been

ample, the Rossland mines would have produced a larger quantity of ore than during any year in their history. It was unfortunate, too, that the shortage should have occurred at a time when the prices of metals were high, and when profits were fairly large. Now that there is plenty of coke the metals have decreased so in price that profits have almost vanished. Nothing special occurred at the several mines of the camp during the past week, and none had any developments to note of special interest. Development continues with good results; the quantity of ore mined was the largest in a number of months.

SLOCAN DISTRICT.

During the past year the heaviest shippers in the Slocan have been: Whitewater, 15,532 tons; Montezuma, 2,900; Standard, 624; Rambler-Cariboo, 323; Canadian group, 85. This was all silver-lead ore.—



Part of British Columbia.

Granby mines, including boilermen, watchmen, office men, etc.—Last week the Sudbury mine, in Deadwood camp, which has been working for some months, discontinued for the winter.—Preparations have been made for continuing work all winter on the Cresus, near Anaconda. In one open-cut ore is shown for a distance of 100 ft.; good ore is also found in the shaft.—Probably nearly 100 men have been laid off in the last 10 days by the C. P. R. and Great Northern on account of the temporary stoppage of mining and smelting operations in this district.—Work is still in progress at the B. C. Copper Co.'s Lone Star and Washington mine, across the boundary line in the State of Washington, being of a development character largely. The ore runs high in copper.

Work has been discontinued on the Sudbury in Deadwood camp. When development ceased the mine was looking well, an 8-ft. lead being exposed at the 150-ft. level. Work will not be resumed until spring.—At the Jewel mine they are driving and raising on the 120 and 330-ft. levels. The orebody is from 2 to 4 ft. wide. On the dump there are from 1,000 to 2,000 tons of ore. Twelve men are working at this property.—After many delays, the electric-driven compressor for the Crescent, furnished by the Allis-Chalmers-Bullock, Ltd., has been installed.

About \$10,000 has been subscribed by local people to help complete the electric zinc plant of the Canadian Zinc Co. at Nelson. Work is now being hurried on this plant. The plan is to treat zinc ore on a basis of electric reduction similar to that successfully employed recently in Sweden. Altogether, some \$60,000 or \$70,000 has been expended already. The plant, as far as shafting and concrete work is concerned, is completed. There now remains merely the installation of machinery and the roofing of the works. The plant should be in operation inside of 90 days and will then begin to treat zinc ore. From lack of this machinery and from one cause and another, the ore has been lying idle upon the dumps, thus preventing in many cases the working of lead properties where silver values are low and zinc percentages are high. As this condition is general all over the Slocan, it will be readily seen that a method which will take care of the zinc will at least double the number of paying properties in this camp as well as many other districts in British Columbia.—Arthur Hendrickson of Lardeau has bonded the Neepawa group on Ten-Mile creek. This property is looking extremely well. The Neepawa has paid from the surface. The drift adit is now about 800 ft. long; there is high-grade ore developed in several places in the mine.

Special Correspondence.

Johannesburg, Transvaal.

*Gloomy Prospects.—Inefficient Kaffir Labor.—Departure of Coolies.
Stagnation in Local Market.—The Diamond Monopoly.—Copper
and Tin Mining.*

A number of annual meetings of gold mining companies have been held in Johannesburg during the past fortnight, and at most of them the forecast (as given by the chairman) for the coming year is distinctly gloomy. The statement made by the chairman of the Glen Deep mine, that since the departure of the Chinese and the substitution of raw Kaffir labor, the profit per month had fallen from £10,000 to £2,000, and the working costs had mounted up five shillings per ton, had a depressing effect on the market and most shares declined. People in London referred to Mr. Schumaker as a pessimist, and hinted that his reference to Chinese labor at the Glen Deep mine was employed to frighten the anti-Chinese party.

But you cannot get away from facts, and the chairman of the Glen Deep simply told the plain truth. His speech accentuates the gloomy outlook for those mines that have been employing Chinese labor. Take the Glen Deep as an example; their thoroughly efficient coolies have been replaced by Kaffirs from Cape Colony, who have signed on for six months. These men have never seen a mine before. It will take nearly three months to teach them how to work. Just when they become efficient, and the Glen Deep profits commence to reach the £10,000 mark again, these black men will leave the mine and the management will start with a new crowd of raw Kaffirs. Under these conditions it is impossible to keep the profits to the high point reached with Chinese labor. The experience of the Glen Deep will be the experience of every mine working with coolies; there will be a serious drop in the profits when they depart.

There are few industries in the world that are called upon to go through such trying ordeals as the mining industry of the Transvaal. Fancy losing a large proportion of your labor every six months or a year! It cost a lot of money, of course, to teach the Chinese how to work in the mines, but when they were once broken in, they remained for three years, whereas the Kaffir seldom remains more than eight months. The fact of the matter is, the general public are just beginning to see what Chinese labor has meant to the Rand these past three years. The leaders of the industry have preached in season and out of season of the utter impossibility of getting down costs by depending entirely on the fluctuating Kaffir labor supply. Now that the coolies are going, and the profits commence to drop, the people will see the force of the argument. Chinese labor on the Rand has proved a distinct success, and if this industry gets into a slough of despond, as seems probable in the next three or four years, it is probable that Asiatic laborers will once more be imported.

No wonder that the sharemarket is almost entirely neglected. Save for transactions in one or two diamond syndicates, hardly any shares are being bought or sold. Money seems to be tight all over the world, and the inducements held out to investors by the Rand, cannot compare with the openings in other parts of the world. A man is not going to put his money into a Transvaal gold mine that will give him his capital back and 5%, when he can get the same terms in a safe industrial concern, like a railroad. The flow of capital to the Rand seems to have entirely ceased, and although desperate efforts are being made to woo capital back by substantial

reductions in working costs, the shocks and disappointments of the past are not easily forgotten.

An interesting announcement was made during the week, namely, that an understanding had been reached by the DeBeers and the Premier, as to the sale of diamonds. Had not these two great producers of diamonds come to some understanding, it is possible that the market for diamonds would have been ruined. For some time past the diamond market has been most unsatisfactory, due to the indiscriminate production of these precious stones, and for the sake of both companies, it is satisfactory to note that the market will be studied in the future, and that diamonds will not become as cheap as marbles. If there is one commodity in the world that justifies a strict monopoly, it is diamonds.

The serious fall in the price of copper has proved disconcerting to many people in the Transvaal who are prospecting for this metal. The copper syndicates will no doubt become fewer until the metal mounts up once more. Very little news is being received from the Gov-



Map of South Africa.

ernment tinfields. Many of the unemployed are anxiously waiting on the Government to redeem their promise and provide work for them on these tin prospects. The work being done by the white men in the municipality of Johannesburg cannot last very much longer, and there is now some talk of the Central South African railroads doing something for these white men when the municipal schemes of the City are completed. By employing the right sort of white men on piece-work, it is claimed that the railroad work can be done as cheaply as with Kaffirs.

Denver, Colorado.

*Denver Mint to Coin Silver.—Curtailement of Nevada Shipments.—
Causes Contributing to Cripple Creek's Success.—Leasing at
Leadville.—Coal Strike.—High-Grading.—Output of Leadville.—
Activity at Cripple Creek.*

Beginning with December 1 the Denver mint will coin silver exclusively. The whole force at the mint will be put to work coining quarter and half-dollars. The superintendent, Frank M. Downer, says that on coins of these denominations, the capacity of the mint will be about \$80,000. The action of the Government in ordering silver coinage exclusively at Denver is of the greatest importance to the mining industry in Colorado. The bullion buyers have been instructed to increase the amount on hand as rapidly as possible. This increased demand for silver will cause many of the mines that have been closed since 1893 to resume.

Owing to the large shipments of ore from Nevada and

the Cœur d'Alene district, the American Smelting & Refining Co. has had to discriminate in favor of Colorado ore at its Denver plant. More ore is offered than can possibly be treated and in order to protect the Colorado producers, the cost of treating Nevada ore has been raised 10%, which is the second increase within a few days. In addition to this, the payments for these same ores has been deferred from 45 to 60 days, as it takes that length of time to realize on the bullion.

In 1904 E. E. Chase, speaking before the summer session of the Columbia School of Mines at Silver Plume, predicted that Cripple Creek would again experience prosperity through the opening of blind veins. It was his opinion that the most important discoveries in the future would be made by cross-cutting from the old workings. The labor troubles, that made Cripple Creek notorious, brought about just the conditions necessary to cause thorough development. The leasing system as it is being followed out in that camp is proving an unqualified success and a great deal of the present prosperity and increased output from these rich mines is due to the astuteness of the miners in finding ore when it is to their own advantage to do so.

At Leadville the recent fall in the price of silver caused some of the lessees to suspend operations, both on the dumps and underground. The demand for silver at the Denver mint will doubtless change this condition. Since the appearance of the brochure recently issued by the United States Geological Survey, giving the results of Emmons' and Irving's work, a great deal of interest has been manifested in diamond-drill work in this camp. The Western Mining Co. is now doing diamond-drill work on its property that will test the conclusions arrived at by the geologists and prove whether the producing area will be greatly extended.

The local strike at Colorado Springs, which has been conducted in such an orderly manner, is slowly gaining ground. The Keystone coal mine has been sold to the Tudor company and is now being operated. This is one of the oldest wagon mines in the district and has been idle since the beginning of the strike. The new management has signed an agreement with the officers of the union, in which all the demands of the miners have been acceded to. This makes all the wagon mines under union conditions, and it is a credit to the union to secure this much of its demand in so peaceful a manner.

The curtailment in output from the Leadville mines and the consequent reduction in the number of men employed is quite evident as the figures for the monthly tonnage begin to appear. Some of the mines are doing development work, while others are stocking ore, preferring to hold it until more favorable prices and conditions are offered by the smelters. The smelters should not be criticized too severely, however. It is their business to extract the metal from the ore. If there be no demand for their product they must necessarily reduce their output.—Transportation facilities are still inadequate to handle the large tonnage from the Cripple Creek district. The Florence & Cripple Creek (narrow-gauge) road has every car and locomotive that it owns, can lease, or borrow, pressed into service. The broad-gauge roads are unable to get sufficient cars to supply the demands made upon them. It is conservative to say that at least 5,000 tons more would have been produced had it been possible to get it to the mills. As it is, the plants at Colorado City and Florence are receiving about all the ore they can handle. About the only remedy is to erect cyanide plants at the mines to treat the low-grade ore, as is being done at Stratton's Independence and a few other mines. The difficulty of treating the unoxidized ores is, however, a great drawback. Under present conditions it might be

wise to give the bromo-cyanide process for telluride ores another trial.

Salt Lake, Utah.

A Lawsuit.—Utah Copper Co.—Bullion Settlements.—Newhouse Corporation.—Ohio Copper Finances.—Tintic Mine Owners.—Coinage of Silver.

The Colorado Mining Co., operating in the Tintic mining district, has been made defendant in a suit filed in the District Court of Utah; Joseph Wilson, one of the original incorporators, has sued to recover 233,336 shares of stock, which has a market valuation of about \$2.50 per share at the present time. The directors of the company refuse to recognize Wilson's claim as being a valid one, and state that they have evidence to show that the plaintiff disposed of all his interests seven years ago. The Utah Copper Co. produced a little more than 3,000,000 lb. copper during the month of November, according to a statement made by the management. The mill is operating satisfactorily with seven units in use; the eighth is to be started during the present month. The ore and bullion settlements reported from Utah companies for November amounted to \$1,929,000, as compared to \$3,012,000 during October. Settlements for the last week of the month aggregated \$346,000.

Orders have been received at the local offices of the Newhouse Co. to resume operations as before the recent curtailment. During the past few months this company has been operating its mill only one shift per day, and had entirely suspended shipments of crude ore. The Boston Consolidated, under the same management, but operating at Bingham, is also displaying more activity. One steam-shovel is working on the porphyry ore, which is being delivered to the bins of the new mill at Garfield. The smelter of the Yampa Smelting Co., at Bingham, is again in operation; the plant is running close to its capacity of 750 tons per day. The new tramway will be ready this week; then the company will no longer have to depend on the Rio Grande & Western railroad. Thomas Weir, who has returned from the annual meeting of the Ohio Copper Co., of which company he is a director, states that the mill, now under construction at Bingham, will be ready about March 1. He states further that the company has been financed, and that there is little reason to doubt that the plans outlined several months ago will be carried into execution.

At the annual meeting of the Tintic Mine Owners' Association, Clarence E. Allen was elected president; John Bern, vice-president; H. S. Joseph, treasurer; and George W. Riter, secretary. The association was formed two years ago, originally for concerted action when the producers were trying to obtain better smelting and freight rates on ore. When the association became well established, the scope of its usefulness was enlarged until now all matters pertaining to the welfare of the mine owners of the Tintic district are referred to the respective committees of this organization.

The question of the Government coining 50,000,000 oz. of silver as a means of relieving the present financial stringency is meeting with popular favor in Salt Lake, and the Commercial Club has taken steps toward calling a convention, at which several of the Western States will be invited to send representatives. Solomon Guggenheim suggested this means of increasing the currency of the country while in the city recently. The object of the proposed convention is to get the matter before Congress in the proper manner. The advocates of the movement insist that there is no intention of bringing politics into the issue by advocating free-coinage of silver, but

that it is purely an emergency proposition and nothing more. Neither the date nor place for the holding of the proposed meeting had been fixed at this writing, but probably will be within the next few days.

The Salt Lake smelting concerns (the Bingham Con. and United States), that signified their intention of leaving Utah, have their plants still in operation. The former is cleaning up the ore in its yards, while the latter is running at full blast, but is not accepting the tonnage which it did before the closing order was given. With the exception of the Mammoth mine, the receipts of ore from the Tintic district have been greatly diminished.

Pioche, Nevada.

Trains Running to Pioche.—Treatment Schedule.—General Conditions in the District.—Wages.—Nevada Utah Co.—Assessment Work.

The railroad is here, unballasted and still in the hands of the construction department, but a mixed train comes and goes every day approximately on time. Mails and express still come by wagon, but these also are to come by train in a few days.

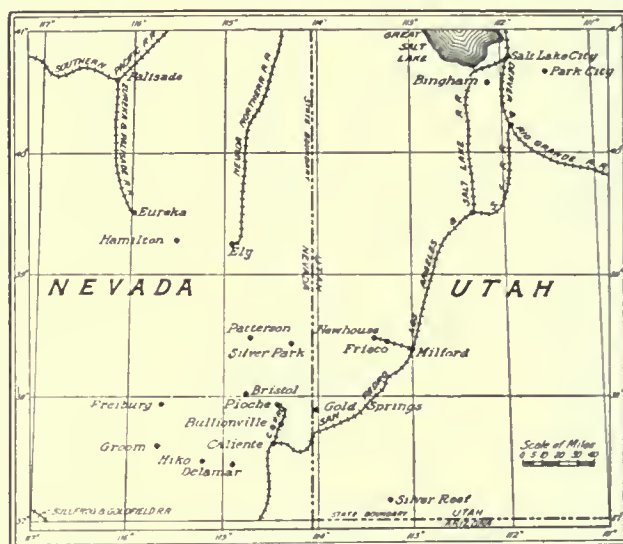
The following schedule has been established for ore: It is based upon net smelter returns, which means gross assay value, less smelter and assay charges. The rates apply from Pioche to Atwoods, Bingham Junction, Garfield, Germania, Hanauer, Murray, Pallas, Salt Lake City, Sandy, and Springville, Utah, and are for \$20 ore, \$4 per ton of 2,000 lb.; \$30 ore, \$4.50; \$40 ore, \$5.25; \$50 ore, \$6; \$60 ore, \$6.50; \$70 ore, \$6.75; \$80 ore, \$7; \$90 ore, \$7.25; \$100 ore, \$7.50; \$150 ore, \$9; \$200 ore, \$10; \$250 ore, \$11; \$300 ore, \$12. From \$300 up to \$1,000 per ton the rate is made by adding to the rate for \$300 ore 2% of the excess value above \$300. A minimum carload is fixed at 40,000 lb. On lots of one to four tons the rate is 40% in excess of the carload rate. Between four and twenty tons the rate is 20% in excess of the carload rate. The average length of haul which these rates cover is about 375 miles, the elevation to be surmounted aggregates about 3,250 ft., and as \$20 ore (net) will constitute probably the bulk of the shipments from the camp, a rate of eleven mills per ton per mile is extremely reasonable.

D. W. Brunton and T. R. Woodbridge for the Taylor & Brunton Co., R. S. Rainsford for the American Smelting & Refining Co., and F. A. Earls for the United States Smelting, Refining & Mining Co., have each recently spent several days looking over the possibilities of the camp for ore supply. This seemed to be rather for the purpose of acquiring knowledge for future use than for present application, as all of them were very positive in stating that there is at present no open market for ore. The United States Co. is refusing to buy ore, and has announced its intention of closing its plant at Bingham Junction in obedience to the recent decree of the United States Court. The Utah Consolidated and Bingham Consolidated have each closed its plant, so that now there is actually no competition in the ore market. Owing to the declining prices for silver, lead, and copper the American Smelting & Refining Co. has been compelled to raise its smelting charges, and accepts no silicious ores except those under contract.

All the above conditions, added to the monetary stringency, have produced their inevitable result here. The Nevada Utah has closed down its mines on the hill and put the machinery into condition for a shut-down of indefinite length. The Mendha, Bristol Consolidated, Ida May, and Comet properties are idle. The Ohio Kentucky, Boston, Lincoln Nevada Prince Consolidated, Nevada Horn Silver, Ohio Pioche, and a number of smaller properties are all working. As an offset to the

closing of the mines on the hill, the Nevada Utah has largely increased its force at Jack Rabbit and has begun shipping the excellent fluxing ores from the Day mine there. It is its purpose to ship 200 tons per day if, as C. H. Swanton, the superintendent, says, it does not involve too much loss; that ore averages quite low-grade at best, and the recent decline in silver and lead threatens to take away the margin of profit.

Since the closing of the mines on the hill there has been much talk about the wage scale. It has been rumored that the Nevada Utah proposed to continue work if the men would accept a lower scale. This rumor I have been unable to verify, but it is certain that there was some foundation for it. The local branch of the Miners' Union took the matter under consideration and promulgated the following as the conditions governing the employment of labor in this camp: An eight-hour day, patronizing company boarding houses not compulsory, miners driving, cross-cutting, or stoping \$3.50, shaft work \$4, muckers \$3.25, cage or skip tenders \$3.50, timbermen in mine \$4, timber framers \$4.50, pipe-men and track-men \$3.50, blacksmiths and tool-sharpeners \$4, engineers \$4, surface men \$3, machine-men, both runners



Map of Eastern Nevada.

and helpers \$4 if company furnishes gun clothes, and \$4.25 if the men furnish them. As this scale is somewhat higher than the scale which the Nevada Utah has been paying, it does not suggest any immediate expansion of activity.

The Boston & Pioche has been sinking a new working shaft which has recently holed into the high-grade ore-body in the Yuba East. It was their intention to begin shipping as soon as this was accomplished, but under present conditions in the ore market they will have to wait for a time.

There is an almost universal opposition here to the proposition that Congress abate the requirement for annual expenditure on mining claims. The argument is that such a law would benefit almost exclusively wild-cat companies, who have withdrawn from exploration and location a vast amount of the mineral-bearing public domain, and that such a law would work great injustice to *bona fide* prospectors.

The crisis through which we are passing will doubtless bring prolonged distress to this mining district. Recovery may be slow. Many readjustments must be made before mining for silver, lead, and copper will again be profitable, but the conviction among all well posted mining men is that the outcome for this county will be beneficial.

Butte, Montana.

November Output.—The Cooke District.—Tungsten Ore in the Butte Continental District.—Southern Cross Mill.—Ore in Calumet Mine of Butte & Bacorn Co.—Progress at Butte & Arizona Property.—Developments in Vicinity of North Butte Properties.

The copper production of the Butte district in November was 8,679,750 lb., while the normal production is from 28,000,000 to 32,000,000 lb. There was a slight increase over the October output, notwithstanding the almost complete suspension of the Butte Coalition Co., which has been taking out only about 50 tons per day in the course of development work. Otherwise conditions have not changed much during the past two months, and there is no prospect of an early increase in operations. The total production remains about a fourth of the normal, but the working forces at the mines is much higher, probably about 40 % of the normal, a fact that has necessarily increased the cost of production considerably. The grade of ore being mined under the restricted output

at a smelter. A small smelter has been running intermittently at Cooke, but the great handicap has been the lack of transportation facilities. The reports made to the backers of the new company are so big that they might be regarded as too good. Veins 50 ft. wide, assaying 5 % copper as an average and carrying some gold and silver, have been opened and are being worked. The prospects of this new company are situated about 15 miles northeast of Cooke, in a separate mountain range. The deposit is in a basin, containing about 400 acres, on top of Goose Lake Mtn. The basin is 10,000 ft. above sea-level, and has two lakes in it, connected by a small stream; the copper deposits are near the lower lake. The men, who discovered this orebody, have partially developed it by two open-cuts at the bottom of the basin. One cut is 50 ft. wide and 6 ft. deep, and the other is 25 ft. long. The entire bottoms of the cuts are in sulphide ore assaying 12 % and better, carrying also gold and silver and, it is reported, platinum.

Several fine deposits of tungsten have been discovered in the Butte Continental district, east of the city; high-grade tungsten ore is being mined from the Birdie claim by Fred Tomek and associates. The Birdie is owned by Samuel Beers and others, and is situated just east of the State of Maine and Mountain Lion claims, properties upon which considerable development work has been done, and is three claims west of the property of the Butte Continental Mining Co. There is an adit 1,800 ft. long on the Birdie in which several stringers of tungsten were cut. Samples of this ore were sent to Denver and the assays returned were high. Tomek and Beers sank on the stringers and opened a body of ore six feet wide; they then drove on this ore for 30 ft., the vein growing larger as the drift progressed. Thirty tons of the ore were concentrated, three into one; and the concentrate assayed 60 % tungsten. Tomek says he has a contract with Pittsburg people to take all their concentrate at \$1.50 per lb., the contract requiring the concentrate to assay 60 % tungsten. Tomek, who is an experienced miner and engineer, says that there is a deposit of tungsten on the Louisiana claim of the Butte Continental Co. Preparations are being made to develop the Birdie extensively.

The waning interest in copper has induced many mining men to return to their first love, gold mining. Lee Mantle, A. E. Springs, and H. L. Frank have resumed operations on the Southern Cross mine, west of Anaconda. A new mill has been erected and has been successfully operated on test runs. The ore of the Southern Cross is not high-grade, and is strictly of a cyaniding character, although the ore carries some coarse gold that can be saved by amalgamation. The mill has a capacity of 100 tons per day and was erected at a cost of \$100,000. The ore is first run through crushers and then through rolls. The ore is fed automatically into a Chilean mill; from there it is sent to the amalgamation plates, where the free gold is recovered. From the plates the tailing is conducted to a Dorr separator, where the sand is separated from the slime. The sand goes to the cyanining plant, where the usual process is used. The slime is treated in a Moore filter. It is believed the mill will prove a success.

At the Calumet mine, belonging to the Butte & Bacorn Co., during the past week streaks of good ore have been found in the drifts on the 1,000-ft. level. The company is driving east and west on two large veins, but nothing of importance was discovered in the east and west veins. During the past week the drifts intersected some northwest and southeast veins forming a juncture with the east and west vein, and these carry ore. It is the history of Butte mines that the northwest and southeast veins



Montana.

is also very much higher than that mined when the price of copper was higher.

The total ore tonnage and copper production, credited to the various companies for November, were:

Companies.	Tons of ore.	Pounds of copper.
Boston & Montana.....	30,000	2,400,000
Anaconda.....	33,750	2,531,250
Butte & Boston.....	1,500	292,500
Washoe.....	3,000	216,000
Parrot.....	1,500	270,000
Trenton.....	3,750	243,750
North Butte.....	11,250	1,125,000
Butte Coalition.....	1,500	120,000
Original.....	15,000	1,200,000
Miscellaneous.....	3,750	281,250
Total.....	111,000	8 679,750

Butte and St. Paul men have for some time been engaged in examining properties in the Cooke mining district of Montana, just north of the Yellowstone National park, and their reports are favorable. W. W. McDowell, W. E. Reynolds, and Guy W. Stapleton of Butte, associated with some St. Paul capitalists, have acquired a number of the best copper claims and have organized the Goose Lake Copper Co., capitalized for \$5,000,000. The stock is closely held and none is offered for sale, the working capital being subscribed by the Butte and St. Paul men. Desultory mining has been carried on in the Cooke district for years, but the mines are far from a railroad and the old miners and prospectors have not had the means to build a road. The new Goose Lake Co. plans to build an electric road from Cooke to Columbus on the Northern Pacific, and to erect

are the richest at depth, but are not rich near the surface. The North Butte veins are of that character.

Reports from the mine of the Butte & Arizona Co. in Arizona continue optimistic. Caspar Schultz, the superintendent, reports to the officials in Butte that the long adit, which is being driven into the mountain to get under the big copper croppings on the surface, should reach the orebody within 30 days. It is now about 1,900 ft. long and will cut at a depth of 800 ft. the vein which outcrops at the surface. The Butte & Arizona is well financed and has been economically managed. Some good ore has been encountered in driving the adit, but little exploration was done on it, as the big vein was the objective.

The Pilot-Butte Co. is making good progress in the shaft being sunk by it near the North Butte properties. In October the shaft was sunk about 100 ft., and that record was about equaled in November; the shaft is now 320 ft. deep. When a depth of 500 ft. is reached, cross-cutting will begin. W. A. Clark has opened a good copper vein at a depth of 500 ft. in the Elm Orlu, an adjoining property, and that has encouraged the management of the Pilot-Butte in the belief that similarly rich ore will be found at 500 ft. in the Pilot, which is surrounded by producing mines. The Elm Orlu is taking out high-grade silver ore to the north; to the East the Butte & Superior is operating, while to the southeast the North Butte is working; to the southwest is the Badger State of the Boston & Montana. Since the Pilot-Butte began operations, the Carlisle and Protection claims, adjoining the Pilot on the east, have been purchased by Eastern men for \$400,000.

Cripple Creek, Colorado.

District Flourishing.—Gold Payroll.—Gold Dollar Co.'s Report.—Drainage Adit.—Independence Mill.—Gold Sovereign Dissention.

While the financial situation has had a tendency to paralyze many classes of industry, it has had a rather stimulating influence upon the Cripple Creek district, through the demand for gold currency; a great revival is experienced in trade conditions as well as in mineral output, due no doubt to the fact that all payrolls have been met in gold by the banks. The Union plant at Florence, which recently resumed operations, is handling about 20 cars per day. The rolling stock of the Florence & Cripple Creek railroad is being taxed to its full capacity to care for the tonnage shipped over it; the shortage in broad-gauge cars is still felt. The decision of the United States R. & R. Co. to raise the charge on outside custom ores 10% and the deferring of settlements from 45 to 60 days does not apply to Colorado, but is made in order to curtail heavy shipments from Canada and Nevada.

It is reported that the Blue Bird mine, one of the most favorably situated mines on Bull hill, is to resume January 1; bad air was the original cause of shutting down; this condition has been overcome and development work will soon begin. The American Leasing Co., which was recently organized, has secured a two-year lease on the Commonwealth property in Arequa gulch. The officers are Henry G. Stoddard, president; George C. Stoddard, secretary; B. L. Hoffmeister, vice-president; Henry K. Thomas, treasurer, and Louis F. Price, superintendent. The main shaft on block 8 of the Cameron school section, which is now 725 ft. deep, is to be sunk to a depth of 800 ft. This is one of the best low-grade leases in the camp; several thousand tons of ore are blocked out and shipments will commence on resumption of treatment by the Golden Cycle plant at Colorado City.—A depth of 325 ft. has been attained by Lambright & Co. in the main shaft of their Raven & Beacon hill property; this is being

sunk to reach the Ophir dike; a cross-cut will be run north from the 400-ft. level if the vein is not encountered before then. The Ophir is a steady producer.—The Delmonico property has resumed after a shut-down of two weeks for repairs to machinery.

The famous W. P. H. lessees, Harrison & Seaver, have returned to the camp and will try their luck on Galena hill; they have secured a lease on the Lucky Two Fraction, east of the Hoosier and Bob Lee properties on Tenderfoot hill.—The Jerry Johnson claim on Ironclad hill is reported to be the scene of an important strike; the vein, $3\frac{1}{2}$ ft. wide, assays \$25 per ton across its whole width. Dan Weyand & Co. have sub-leased this ground from Henry P. Dahl. The annual report of the Gold Dollar M. Co. is out and shows a prosperous year; ore produced amounted to 3,217 tons, with a gross value of \$82,100; the royalties on this ore to the company are \$13,637.62. There is \$11,625.70 in the company treasury. There are seven sets of lessees on the property. In the upper workings are large ore reserves; the company is awaiting the completion of the drainage adit, to the construction of which it contributed \$4,000, before it develops the ore-shoots known to extend below water-level. The drainage adit is now in 1,050 ft. and is being driven with all possible dispatch.

Construction work on the Stratton's Independence mill reservoir is being rapidly pushed; the dam across Wilson creek is expected to retain 17,000,000 gal. Practically all the buildings of the mill are under cover and Harry Nelson, Philip Argall's assistant, has moved to Victor in order to personally oversee the installation of the mill machinery, the foundations and building for which have been rapidly erected; A. R. Minner is constructing engineer.—On November 18, the British-American Co., working the South Dante, declared a monthly dividend of \$6,000, the largest heretofore being \$1,000. A new orebody has been discovered on the 500-ft. level during the last week; it is planned to ship two cars per day. A new ore-house is being built and a new hoist, recently ordered from Denver, is being installed. The present management of the Gold Sovereign is being criticized, and an effort will be made at the annual meeting on January 2 to have it changed. O. H. Hinds, of Le Mars, Iowa, holding 135,000 shares, has sent out circulars making sensational charges, which are answered by Mr. Rapp, the president of the company, in a letter to stockholders; the mine is affected by the destruction of the Golden Cycle mill, as much of the ore is low-grade.

The Forest Queen reports a new orebody on the 400-ft. level which assays from an ounce to 12 oz. per ton; this ore-shoot is 4 ft. wide and is but a short distance from the shaft.—The Henry Adney reports another strike on the 500-ft. level, assays from which are more amazing than any heretofore obtained on this property; a sample taken from the muck pile assayed 169 oz., while the breast of the drift has assayed as high as \$1,000 per ton.

Mexico.

A French Criticism.—Boleo Copper Mines.—The Mazapil Copper Co.—El Lustre Becomes a Success.—Suspension of Work.—Good Results at El Oro.—Gold Production.

The closing down of the mines at Cananea has been taken as the basis for a more or less deserved and merited criticism by *Le Courrier*, the French journal of Mexico, of the way in which stock speculators in the United States may thus paralyze an immense industry and bring distress to thousands of homes, and then compare it to the work of the French company in Lower California (the Boleo Copper Co., of La Paz and Santa Rosalia, owned and operated by the Paris Rothschilds),

which, notwithstanding the fluctuations in the copper market, continues to produce its 1,000 tons of ore daily, running about 4% copper, thereby keeping in operation its mines, smelter, railroad, and sailing vessels. Neither do we hear of the great Rio Tinto mines of Spain closing down. And assuredly these things lead one to believe that the criticisms are just and that there must be something in error with our American methods. Is this depression due wholly to speculation and stock manipulation, or is there something more behind it that calls for a remedy? Certainly the Boleo company goes uninterruptedly and quietly on its way. And the mention of this company and the Rio Tinto brings to mind the news that Walter J. Browning, of Saltillo, Coahuila, Mexico, is to be given the management of the Rio Tinto mines in recognition of his building up and management of the Mazapil Copper Co., which has quietly risen to an enterprise of considerable magnitude. This English company, beginning in a small way a comparatively few years ago at Mazapil and Concepcion del Oro, on the line between the States of Zacatecas and Coahuila, with a small smelter at the former camp, gradually added to its holdings and

possible, a centrifugal 5-stage electric pump, electric hoists, etc., together with the increasing of the smelting plant to three new 36 by 180 in. stacks, estimated at 200 tons each, is undoubtedly placing this company where it will begin to get good returns for its years of expenditure. The experience of its manager, R. M. Bissell, at the Pittsburg steel plants, had taught him the necessity of a large production in order to render a low-grade proposition economically successful.

It is gratifying indeed to read the annual report of El Oro Mining & Railway Co., which has just been made public, at a time when so many properties are being closed down, latest among which are the Tiro General of Charcos, in San Luis Potosi; the Panuco, of the Continental Copper Co., near Monclova, in Coahuila; the mines of the Jimulco Mining Co., closely allied to the last named, at Jimulco, in Coahuila; and the Tepezalana y Anexas, at Tepezala, in Aguascalientes. But to go back to the report of the El Oro Mining & Railway Co. and its subsidiary companies, the Mexican Mines of El Oro, and the Somera. The returns from these companies during the past year have certainly been most encouraging with total receipts of £531,707.

Though this is slightly less than the previous year, when it was £539,452, nevertheless, the expenses were not so heavy and the net profits during the past year amounted to £212,580 as against £199,451 last year and £166,955 the year before that, and allowed of dividends of £165,000 as against the £135,000 distributed for the year before. Most creditable of all to the management has been the improvement in the percentage of extraction, which in 1906-7 has been 86.6% while in 1905-6 it was 85%; and yet both of these years, compared with the 73.8% of 1904-5 before the tube-mills were introduced, give evidence of the great value of these mills to this company in the treatment of its ores. This additional saving has aided in compensating for the reduction in the average value of the ore treated, from



Mexico.

then erected a larger plant at Concepcion del Oro. Continually adding to its territory, the company built its own railroad from Saltillo (the capital of Coahuila) to Concepcion del Oro and its mines, and this year has seen the completion and blowing in of its new 500-ton smelting plant at Saltillo. It is stated that \$8,000,000 gold has been refused by the company for its holdings, yet it is a company of which comparatively little is heard, while it continues quietly on its way. Another company which, though not to be compared with the aforementioned as it has not yet reached such magnitude and independence, yet for pluck and perseverance is hard to be excelled, deserves attention here, namely, El Lustre Mining Co., of Santa Maria del Oro, in the State of Durango. This company of Pittsburg capitalists has apparently tried every known process for the treatment of its ores. The old mill shows the alterations for amalgamation, lixiviation, concentration, cyanidation, and everything else, only to meet with failure and great and expensive losses, until finally smelting was resorted to, and a little over two years ago it began to look as though daylight was appearing. Even then expensive experiments had to be carried through with various kinds of furnaces, hot-blasts, etc. But development work went steadily on, and immense bodies of highly silicious low-grade sulphide ores have been opened up. The consequent reduction in mining by reason of handling such large bodies, the introduction of gas-producers, with gas-engines and electric power wherever

\$10.83 in 1904-5 to \$9.58 in 1905-6 and \$8.53 in 1906-7. Added to this has been a reduction in the cost per ton of production from \$6.87 in 1904-5 to \$5.73 in 1905-6 and \$5.01 in 1906-7, which has been made possible in part by the increase in output from 142,571 tons in 1904-5 to 234,079 tons in 1905-6 and 263,149 tons this past year. Though the present ore reserve is estimated at 532,523 tons as against that of 606,119 and 672,850 the two preceding years, it must be noted that development work was considerably curtailed and also that the orebody below the fourth level, or 386 ft., though it has been opened up on the fifth and sixth levels, is yet to be tested, being in a vein that has been found profitable at a depth of 1,150 ft. Although the estimated average value of the reserve is but \$8.44, the improvement in extraction and the lowering of the cost of production should easily enable the company to continue its excellent record as a profitable mining investment. An additional saving and reduction in cost is expected from a new crushing and classifying device of D. N. Hood of the Hood Process Co., New York, with which the company is experimenting, and which it is said is working successfully. It should be further noted to the credit of the camp of El Oro, that the Esperanza Mining Co. continues to make monthly profits of something like £21,000 or a little over \$200,000, while the Dos Estrellas earns about double that amount; and their principal product being gold, the present low markets do not affect these rich mines.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

LEASES at Goldfield, Nevada, generally run from six months to a year; the royalty is generally from 20 to 25% on the net smelter returns.

IN A cyanide plant any confusion in regard to weak solutions, strong solutions, and other pipes is easily avoided by painting each of the pipes a distinctive color.

CAMS have been designed with a special involute face so that a speed of 110 drops per minute was safely attained, when the height of drop was as great as seven inches.

FILTER-PRESSES are used at the Silver King mill, Park City, Utah, for concentrating the rich slime from the oxidized silver-lead ore. It is impossible to save the scales of silver chloride on the tables and so the slime is filter-pressed.

THE concentration of gold above water-level is illustrated by these figures from the El Oro district, Mexico: In oxidized ore the ratio of gold to silver is $6\frac{1}{2}$ gm. of silver to 1 gm. of gold; in the sulphide ore the proportion is 15 to 1.

A CUPEL molding machine is used at several cyanide mills for briquetting the precipitate. In this way the loss in refining due to dusting is greatly decreased. Generally a small rectangular mold is substituted for the circular cupel-form.

THE Moore filter-baskets are discharged, in New Zealand, by simply opening a valve, which connects with the atmosphere; the in-rush of air to fill the partial vacuum loosens the cake apparently as effectively as the American practice of blowing compressed air inside the filter-leaves.

LEAD SMELTING was a more important industry in the United States in 1900 than copper smelting; by 1905 copper had become more important than lead smelting; this has been due mainly to the change in American smelting practice whereby 'dry' gold and silver ores are smelted with copper ores as 'gatherers' instead of lead ores.

COST of tube-milling on the Rand is illustrated by the following costs per ton: Glen Deep, 21.28c.; Nourse mines, 10.98c.; Langlaagte Deep, 14.24c.; Simmer & Jack, 13.37c. Due to fine-grinding the recovery has also risen so that it is now at the Langlaagte Deep theoretically 95.79% and actually 96%, at the Nourse Deep 93.40% and 92.97%, at the Glen Deep 93.64% and 93.90%, respectively.

IN sampling rich gold and silver ores, which require fine grinding for proper sampling, the quartering should be done on tables covered with plate glass. A wooden surface is retentive of fine particles of ore, especially particles of metallic gold or silver; an iron surface wears unevenly, and besides scales of it are liable to flake off and get into the sample. A glass surface is smooth, hard, readily cleaned, and easily replaced, if broken.

A SUBSIDENCE occurred recently at the Waihi mine, New Zealand; as the stopes at Waihi are filled with waste as soon as they are depleted, this subsidence only amounted at surface to about two inches. Although the subsidence occurred near No. 1 shaft, this, except for a

slight tightness between the guides, was unaffected. This occurrence helps strengthen the belief that, with moderately careful filling of the stopes, no trouble need ever be feared at surface from subsidence due to underground mining.

AN air-tight door should be placed in the first stretch of untimbered ground near the mouth of all adits so that, in case the surface buildings near the mouth of the adit burn, the door can be closed and the smoke kept out of the mine. This door should be hung so that it will close itself. It should be held open by a wire or rope which leads to the mouth of the adit, so that the door can be quickly closed from surface. Neglect of this precaution has caused the loss of several lives, for instance at the Kearsarge mine near Virginia City, Montana.

MACHINE SHARPENING of drill-steel on the Rand costs \$15.50 per 1,000. Calculating that 1,000 machine-sharpened bits are equivalent to only 860 hand-sharpened bits in wearing ability, this represents a saving on the Rand of 3.7c. per ton of ore crushed. The reason for the greater life of a hand-sharpened bit is probably due to the fact that the hand-sharpened bit is hammered more in the sharpening and therefore has a smaller-grained crystalline structure than the machine-sharpened steel. The bit should not be shaped too quickly by a machine-sharpener; steel is improved by hammering.

ON a gold-bearing mispickel ore at the Deloro mill at Deloro, Ontario, a gold extraction of 88 to 90% was made. The ore was stamped to 40 mesh and then amalgamated, thus recovering 57% of the gold. The pulp was then classified and concentrated upon vanners and tables. The tailing assayed only 2 to 2.5% of the original gold content and only 0.5% of the arsenic content. The concentrate was then treated by cyanogen bromide and 90.5% of the gold was recovered by zinc-dust precipitation. After the gold was extracted the concentrate was sent to the arsenic furnaces where the arsenic was recovered as arsenic white.

MINING litigation arising from the law of the apex has been avoided in the Warren and the Clifton-Morenci districts of Arizona by the interested companies agreeing to bound their orebodies by vertical side and end-lines. This has resulted in a system of development peculiar to these camps. At Bisbee, in developing a level a drift is run, as soon as possible, parallel with, and about 40 or 50 ft. from, any boundary line which separates the property from that of another company. Thus they develop and mine any ore occurring near the boundary, while the ground is still strong, and leave to the neighbor the disadvantage of mining in heavy ground in case the orebody extends beyond the boundary.

WIND PRESSURE varies with the square of the velocity of the wind, but there is as yet no agreement as to the constant in the formula. According to Smeaton, $P = 0.005V^2$; according to Martin, $P = 0.004V^2$; according to Whipple and Dines, $P = 0.0029V^2$; where P is the pressure, when the surface is at right angles to the direction of the wind, in lb. per sq. ft. and V is the velocity in miles per hour. At 60 miles per hour these formulæ give the pressure in lb. per sq. ft. as 18, 14.4, and 10.44, respectively. The Smeaton formula is generally accepted as correct for small surfaces such as used in wind-mill practice, but it gives too large results for large solid bodies. The Smeaton formula is used by the U. S. Signal Service. Kidder in his Pocket-book accepts the Martin formula for building purposes.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

Cyanidation of Ore Containing Both Coarse and Fine Gold.

The Editor:

Sir—The columns of your well-known journal record the pioneer work done in the early 'nineties on the Pacific coast by Almarin B. Paul, more especially the crushing in stamp-mills of gold ore with weak cyanide solution in place of water. It is somewhat surprising, therefore, that more attention has not been paid since then to the recovery by amalgamation or otherwise of the coarser gold particles in such pulp. While crushing with cyanide solution materially assists in dissolving the gold by means of the agitation, aeration, and thorough contact, yet gold particles of appreciable size do not completely dissolve within the practicable time limit of ordinary cyanide treatment, and are hence liable to be discharged with the residue unless some auxiliary method of recovery be employed. When the gold particles are fine enough to dissolve in a reasonable time, the necessity for amalgamation, of course, does not exist.

Among the published recommendations of a famous California millman—C. H. Aaron—prior to the discovery of the cyanide process, was the steady dripping into the mortar-box of cyanide solution to brighten the plates and gold particles in the ore being crushed. This feature alone would indicate a greater facility for gold amalgamation in a cyanide solution pulp than in a water pulp. The use of ordinary amalgamated copper plates for the above purpose is, however, subject to the disadvantage that both mercury and copper gradually dissolve in the solution and are re-deposited in the zinc-boxes, thus affecting clean-up and refining operations. Concentration of the pulp would no doubt serve to recover most of the coarser gold, but such an equipment seems cumbersome and expensive to install and operate, if solely for the purpose of recovering that fraction of the gold whose chemical and physical condition is such as to most readily insure contact and retention by a mercury surface. At present crushing with cyanide solution appears best adapted for the tube-milling of an ore which has been dry-crushed with rolls and which carries only fine gold. In this case amalgamation is not needed, the difficulty is minimized of accurately determining the value of the ore before treatment, and the small volume of solution in circulation reduces the danger of loss of soluble gold by leakages or overflows. It is to be hoped that the researches of the many skilled and progressive metallurgists of the Western mining States will develop a method of as satisfactorily dealing with a cyanide solution pulp carrying a portion of its values in coarse gold.

VIATOR.

City of Mexico, October 6.

[Prompted by this communication, we wrote to several cyanide specialists, stating the problem as follows:

"Given an ore containing some coarse gold, as well as gold finely divided, what steps would you take to save the coarse gold, which otherwise will escape solution in cyanide?"

To this question we have received several replies, one of which we publish herewith. The others will appear next week.—Editor.]

The Editor:

Sir—Replying to your question:

"Given an ore containing some coarse gold as well as gold finely divided, what steps would you take to save

the coarse gold, which otherwise will escape solution in cyanide?"

1. Should the coarse gold occur in some quantity and the ore is otherwise suitable for crushing in dilute solution, I would proceed as a first step to amalgamate it in the mills or batteries, and on copper plates. The small amount of mercury soluble in say 0.02% KCN solution will, as cyanide of mercury, greatly accelerate the solution of the fine gold as well as improve the precipitation of the precious metals in the zinc boxes.

2. When the ore is crushed in water, plate amalgamation will usually take care of the coarse gold, while the separated slime and sand can be cyanided in the usual manner.

3. A satisfactory modification of 1 and 2 is to pass the ore, crushed either in cyanide solution or in water—but preferably the former—through a spitzkasten, so as to draw off the coarse gold with a small amount of concentrate. This product should then be ground and amalgamated in pans, and where the crushing is conducted in cyanide solutions the overflow from the pans can, after passing a precautionary settler, join the main mill-stream and pass direct to the extraction plant. In this way (No. 3) the amalgamation of the coarse gold, even in a large mill, can often be quite satisfactorily and economically conducted in, say, two pans. Further advantages might be pointed out, such as the benefit to be derived from the finer grinding of the concentrate, and where cyanide solution is the medium, much stronger solution than 0.02% may be used, without excessive mercury loss. Crushing in cyanide solution has come to stay, and with the additional feature of amalgamation, will take care of both the coarse and fine gold in the direct treatment of perhaps the majority of gold ores. I advocate strongly the removal by amalgamation of all the coarse gold instead of fine-grinding to render it readily soluble in cyanide. Plate amalgamation is quite feasible, but the solutions should not exceed 0.02% cyanide, otherwise both mercury and copper are too freely dissolved. Where crushing and amalgamation in cyanide solutions is practised, ordinary precautions must be taken against loss of solution. The mill-floors should be constructed of cement saturated with tar on the surfaces, or better still, of asphaltum, with, in either case, gutters to conduct all drainage to a central sump.

4. In dry-crushing mills, the coarse gold can be recovered from the leached sand.

(a) By sluicing them over riffles.

(b) By placing a spitzkasten in the tail-sluiice.

The concentrate from either (a) or (b) should be ground and amalgamated in pans or Chilean mills, as it will contain all the coarse gold.

I used the (a) method quite successfully for several years in a large dry-crushing and roasting plant. In that case the sluice was 300 ft. long, 20 in. wide, and set at an inclination of 1 in 16; the bottom was filled with iron riffles; 60 tons of sand and 100 tons of water per hour passed through the sluice. The riffles were cleaned up once a week, when the first 50 ft. usually gave 90% of the coarse gold in a concentrate carrying from 5 to 10 oz. gold per ton. The last 50 ft. of the flume did not show a trace of coarse gold but gave a concentrate of partially roasted ore, assaying about 0.15 oz. per ton. The total product from the riffles amounted to about 2% of the weight of tailing passing through the flume.

The final tailing discharged on the dump averaged 0.065 oz. gold per ton, but nothing further could be profitably removed by concentration, without finer grinding, as was amply demonstrated to certain parties who later erected a large plant of Wilfley tables, etc., at a cost exceeding \$50,000; this plant, however, being an unqualified fail-

ure, was dismantled and removed after a few months' trial of these dumps. I believe then, that the sluice and riffle must be admitted to be an effective means for the removal of coarse gold from sand, and under proper conditions I prefer it to spitzkasten. Blankets, sheep-skins, and such like are time-honored, though antiquated means for catching gold and concentrate in flumes, streams, and on tables, so that a minimum quantity of material containing practically all the coarse gold can be submitted to a grinding and amalgamation process. Amalgamating all the crushed ore, when low-grade gold ores are crushed in cyanide solutions, is seldom either necessary or expedient. A riffle or spitzkasten concentrate will usually contain all the coarse gold not amenable to cyanide, and the cost and trouble of amalgamating 90 to 95% of the ore is eliminated. Along these lines I look for the next great advance in the metallurgy of gold ores. My ideas may be summarized as follows:

(c) The substitution of weak cyanide solutions for water in the crushing apparatus, circulating the mill solutions in a closed system.

(d) The removal of the coarse gold in a concentrate by riffle or spitzkasten.

(e) Amalgamating the coarse gold in pans and similar apparatus.

By 'coarse' gold in this article I mean metallic gold that by reason of its size or for other causes escapes solution in ordinary cyanide treatment. I further assume that it can be collected in a small amount of concentrate, and my experience shows this assumption is well founded.

PHILIP ARGALL.

Denver, October 14.

Questions by a Practical Miner.

The Editor:

Sir—The letter in your paper of November 9 purporting to be from a practical miner is so evidently unjust that I am going to dignify it by answering. The mine in question has a steam-driven compressor plant at its old mill, so that should, by any manner of means, the new plant break down, we could still keep mining. Again, the power-plant in question is a tandem-compound Corliss belt-driven generating set. While there is a possibility, there is hardly a probability of its breaking down, as it has 50% excess power over what is required. Further, a hydro-electric plant on the river two miles away would have cost three times as much as the steam plant, as there are no roads and the country is too precipitous, besides taking twice as long to install. This was decided by an electrical engineer at Los Angeles, of national reputation.

If it was necessary to put in a duplicate steam-generating set, why should it not be necessary, and even more so, to put in a duplicate hydro-electric plant, transmission lines, etc., where the floods are as serious as in the American river. Again, the wood fuel costs little, as only white fir and cedar, which are no good commercially, are burned, together with the slabs from our own saw-mill. That part of the letter relating to the "practical miner" and the quartz outcrop is so ridiculous, if you knew the truth, that it is not worth answering. I have had 25 years actual mining experience from chuck-tender to mine-foreman, and then superintendent from Rossland to Arizona, and I have never seen two Corliss or electric hoists on a shaft, for fear of the breaking down of one. Duplicate compressor-plants for the same reason; duplicate engines in either a concentrating or stamp-mill, for the same reason. But what I have seen, where the man in command knew his business, was a reserve steam plant to back up any failure of the hydro-electric plant,

where the mine and mill depended on the latter. Does it make any difference which is installed first? If the mine development is waiting for the central power station, I would think it logical to install the quickest generating set. If this was a main power-plant for selling power, then the idea of three engines might be good. As the life of any mine is limited, why go to this expense, especially if it is not justified? I have also on occasion been accused of being a 'practical' mine manager. Perhaps I get it from not discussing in print, on hearsay, only what I thought were the mistakes of the other fellow. Rather let us see with our own eyes and discuss the points with the man in charge than rush into print with garbled information.

The writer welcomes criticism of his mining or management at any time, if he makes mistakes and if this criticism comes from an engineer with more experience than himself, but he does resent your publishing information which is unjust, erroneous, and given by a man never on the ground and certainly not a 'practical miner.'

H. C. C.

Westville, Cal., November 13.

[We are glad to insert this letter. The one to which it refers was not published without a foot-note demurring to some of the inferences.—Editor.]

Wall Street.

[A copy of the following letter has been sent to us. We are glad to publish it.—EDITOR.]

Mr. Robert Schorr,
61 Fremont St., City.

Dear Sir: I have your letter of the 18th inst. in which you refer me to an editorial on page 598 of the last number of the MINING AND SCIENTIFIC PRESS, entitled 'Wall Street.' As stated by you in your letter, the editorial in question "hardly suits my views." I agree with our editor in regarding the popular idea of Wall Street as a slander, and in believing that "populist orators may be responsible for such a slander, but there are reasons less superficial."

I differ with him, however, in his analysis "of this prejudice against Wall Street," for prejudice it undoubtedly is. Our editor asks, "Is it merely the expression of ignorance or due to a jealousy of those that pull the strings?" He thinks it is neither of these, but that it is due to the fact that those citizens of various communities who are distinguished for wealth and initiative are absorbed by Wall Street and become mere gamblers.

As I see it, his explanation takes it for granted that Wall Street is a centre of gambling, and that those who have offices or operate in the Wall St. district are mere gamblers, and that their labors are lost to productive industries. This is the part of his editorial that I am not willing to grant. In order that we may have a common starting point, let us consider for a moment what Wall Street really is. Under the National Banking Act the banks of the country may be divided into three classes: (1) Country banks, (2) reserve city banks, and (3) central reserve city banks, all of them being required under the law to carry a certain percentage of reserve funds against their deposits. They differ in that the reserve of the country banks may be carried partially as lawful money and partly as deposits in reserve city banks, while the reserve of the reserve city banks may be similarly divided between lawful money and deposits in approved central reserve city banks. The immediate result of this system is to cause the reserve cities, such as San Francisco, to be the financial mentor of the towns tributary thereto, and at the same time to cause reserve cities, such as San

Francisco is, to be tributary to the central reserve cities. In other words, the United States National Banking Act provides that certain cities of the country shall be pre-eminently the money and credit centres of the country.

Of these central reserve cities, New York is naturally the largest and most important, due to many natural causes, of which we may mention its being the largest and oldest central reserve city, and its being the gateway to Europe and a large portion of the civilized world. Being by law and by natural causes the money and credit centre of America, it follows of necessity that New York is the financial centre of the country.

Being the financial centre, it follows that New York is the most convenient and necessary location of the fiscal offices of the large corporations of the country. Being the money and credit centre of the country, and at the same time the centre of the fiscal operations of our large corporations, it follows that New York is the greatest security market of America. In this way we are forced to the conclusion that New York City is by law and by common consent the centre of banking, of corporate fiscal operations, and of security trading in so far as America is concerned. As the banking business is intimately connected with the financing of new enterprises, it is not surprising that by far the greater portion of such new undertakings are financed from the head and fountain of the banking business.

In New York the various institutions established to facilitate the operations above mentioned are to a large extent confined to the lower end of Manhattan, and it is this part of the city that is known throughout the country as Wall Street, so called because of the fact that Wall St. itself is the centre of these activities. The institutions which make up Wall Street are the banks, the New York Stock Exchange, and the fiscal offices of the large corporations.

The so-called Curb market, although an integral part of Wall Street, as popularly understood, is but as a drop in the bucket, and is not, in reality, an important part of the great financial community centred about Wall and Broad streets. As our editor will doubtless admit that neither the banks nor the corporation offices are gambling institutions, we may confine our attention to the New York Stock Exchange. It is my personal judgment that much, if not most, of the prejudice regarding this institution has come about through the misconception that this institution differs from the bucket-shops throughout the country only in size. No more ignorant injustice nor a more malicious misrepresentation could be perpetrated against any institution.

In the first place, the members of the exchange operate under an extremely stringent set of rules, which are administered absolutely without fear or favor. Under these rules every sale or purchase of a security on the floor of the exchange is as much a *bona fide* transaction as it is possible to make a transaction *bona fide*. It is true that many transactions are cleared one against the other in the same manner that bank checks are cleared in the clearing houses, but does this make a gambling transaction?—if so, we are all gamblers, except the inhabitants of the poor-houses. Do you call a man a gambler who issues a check not knowing for certain that the check will be turned into lawful money? Most certainly not. Is it the *bona fide* purchase of securities on margin to which our friends object? Do they call buying goods on time, gambling? Is it fair to say that the man who buys steel common on time is a gambler and the man who buys potatoes at ninety days is not? They both buy with the same object—to make a profit; and at the same time, to tie up as little working capital as possible. Or, is it *bona fide* 'short selling' upon which their wrath is

centred? Is the manufacturer who sells his output for delivery in ninety days a gambler? Should he be classed with the farmer who sells his crop before it matures, or the man who sells securities for future delivery? As to the underwriting syndicates, isn't it as legitimate and as honest to buy securities in bulk and to retail them at a profit as it is to buy and sell merchandise in the same way? If we are to call these transactions gambling, then we are forced to admit that all business is upon a plane with faro and roulette. If one defines gambling as a risking of capital, then all business is gambling; but this is not the definition of gambling. As I see it, gambling is the act of hazarding wealth upon mere chance; as opposed to hazarding wealth upon mature judgment, which is a legitimate business transaction. Under this definition, the operations of the New York Stock Exchange—that is to say, the purchase and sale of securities and credits—is as legitimate a business transaction as is the purchase and sale of commodities. No one would contend for a moment that there are no rascals in Wall Street, no more than he would that all grocers are honest; yet I do maintain that there is nothing inherently dishonest or nothing in the nature of gambling in either the business of a Wall Street operator or that of the grocer. For a green country boy to undertake to operate the largest grocery in San Francisco without studying the problems involved is gambling, just as it is for a man to innocently saunter into Wall Street in the same spirit. It is just this view of the stock market that brings about the shearing of the lambs. Were I to define a lamb, I would say that he is a man who speculates in Wall Street *believing that he is up against a gambling game*.

In order that my position in this matter may not be misunderstood, it may be well to state that I do not speak as an insider, for I have never purchased a security on margin, nor have I ever traded in a bucket-shop. I speak merely as a man who believes with all his soul in fair play.

A. G. McLAUGHLIN.

San Francisco, November 23.

NEW COLOMBIAN RAILWAY.—The contractors for the railway now under construction from a point on the Magdalena river to Bogota, have instructions from the company in London to complete the road to its terminals by the end of the present year, if possible, but owing to the conditions and the damage done to the part of the road already built by the recent storms, requiring extensive repairs on that part, even to the point of considerable rebuilding, it is considered impossible to carry out the instructions as to time, although the work is being pushed forward vigorously. There are still 35 of the 171 km. (kilometre = 0.62 of a mile) to be built, and when completed this line will give the Railway Concession & Contract Co. of London, which has also purchased the railway from Cartagena to Calamar, and the boats of the Fluvial Steamboat Co. on the Magdalena river, a direct line from the port of Cartagena to the capital of the Republic. The company is also considering the future construction of the railway connecting the Magdalena with Medellin, which road would tap one of the richest mineral districts of Colombia. There are 80 km. of this road completed, but there remain about 160 km. to build.

MALAYSIAN TIN.—The following statement shows the output of tin from the Federated Malay States for the first four months of the year 1907. The figures represent tons of 2,240 lb. Perak, 8,187; Selangor, 5,067; Negri Sembilan, 1,386; Pahang, 623 tons. Total, 15,263 tons, a falling off from last year's output of 204 tons.

Measuring Industrial Temperatures.

Written for the MINING AND SCIENTIFIC PRESS
By THOMAS T. READ.

Few subjects excite a livelier present interest among scientific men engaged in industrial work than the accurate measuring of temperature. With a growing recognition of the important influence of apparently slight changes of temperature in many well-known processes, and the tendency to secure economy of operation by ascertaining the conditions necessary to secure the maximum efficiency of operation, has come a desire to be informed as to the apparatus and methods available for the ready measuring and recording of temperature, under industrial conditions. To this desire is traceable the recent rapid growth of commercial pyrometry, or the measurement of temperatures above the ordinary range.

The characteristics that a pyrometric instrument must possess are easily stated. In the first place it must possess the degree of accuracy commercially required. All the recent types of instrument are perfectly satisfactory in this regard, and many possess an accuracy sufficing even for the most exacting demands of scientific work. It must also remain accurate with constant use. Many instruments that are satisfactory in every other regard fail in this requirement, either necessitating constant re-

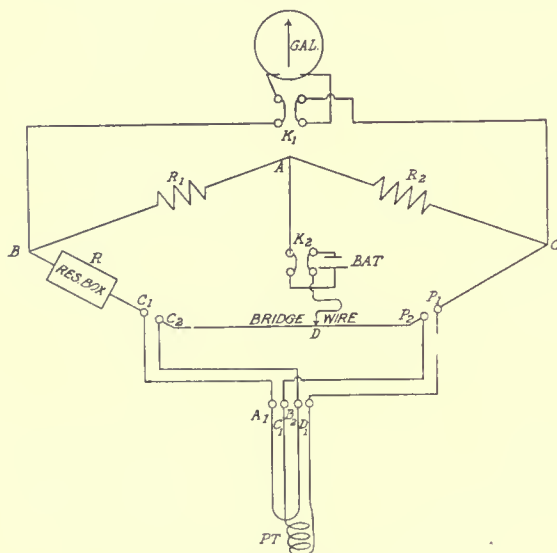


Fig. 1.—Principle of Resistance Pyrometer.

standardization or else slowly burning out with long exposure to a high temperature. In addition, the pyrometer should be simple and easy to use, so that it is not easily injured or put out of adjustment. It should be capable of making a continuous record, for in many cases the chief use of pyrometric determinations is the securing of uniformity and constancy of operation.

Passing over the liquid and gas thermometers, which in their present state are adapted to measure fairly high temperatures, but which are not generally fitted for industrial conditions, and are not capable of making a continuous record, we come to the pyrometers that make use of the differential expansion of an iron-carbon rod under heating. These were used to some extent a few years ago, but they are no longer regarded with favor. They possess all the disadvantages of the mercury thermometer, except liability to breakage. With continued use the iron rod becomes permanently expanded, and the scale no longer reads correctly.

An early type is illustrated by the Seger cones. These are slender cones of refractory materials, china clay, quartz, etc., the composition of the mixture being so ad-

justed that it fuses at a given point. By using a series of cones of graded composition, a scale of temperature is obtained. A cone is considered to be fused when its top bends so as to point directly downward. Like the pneumatic rock-drill, Seger cones are theoretically unsatisfactory, but in practice they are better suited for use in their own particular field than any substitute. They measure a rising temperature only; the fusing point is affected by the rate at which the temperature rises and by dust and the gases of combustion. Nor is it possible to obtain a continuous record, but because they are of similar composition to the material being heated in the manufacture of clay products, and consequently both are similarly affected, they are satisfactory in spite of their inaccuracies, and therefore this type of pyrometer remains in common use in the manufacture of porcelain, china, earthenware, and brick. Recently more accurate methods have been introduced.

Several types of pyrometer depend in their action upon specific heat. The Siemens pyrometer was practically a calorimeter. A ball of the proper size was placed in the furnace and allowed to come to the same temperature. It was then removed and placed in a known quantity of water, and from the rise in temperature of the water the temperature could be computed. The objections to this are obvious. Another method is to lead water with a constant rate of flow through the furnace in an iron tube. By measuring the temperature of the inflow and the outflow, the temperature of the furnace is easily computed. In the ordinary application of this method the computation is done mechanically. The inconvenience attending the use of this apparatus is also apparent. A method which has found some application to the measuring of the temperatures of hot blasts is to divert a small portion of the blast through an apparatus somewhat like an injector, so proportioned, usually, as to take in three or four times as much outside air as there is blast. The temperature of the resulting mixture is given by an ordinary thermometer. From this the temperature of the blast is obtained. It is seen that slight variations in the temperature of the outside air will make large errors in the apparent temperature of the blast. The device is not especially convenient to use, and cannot be made recording, hence the use of it is limited.

Electrical resistance pyrometry is of wide application in England, but has not been received with much favor on the Continent or in the United States, where the thermo-electric methods are now generally preferred. In the resistance method a coil of platinum wire is exposed to the heat, the increase in the resistance is proportional to the temperature. The variation in the resistance is measured by means of a Wheatstone bridge, this latter being generally so calibrated as to read directly to degrees. The taking of a reading includes the introducing of the coil at the point where the temperature is to be measured, allowing it to remain there sufficiently long to attain the same temperature as the furnace, and the bringing of the bridge galvanometer to balance by adjusting the resistance. The temperature is

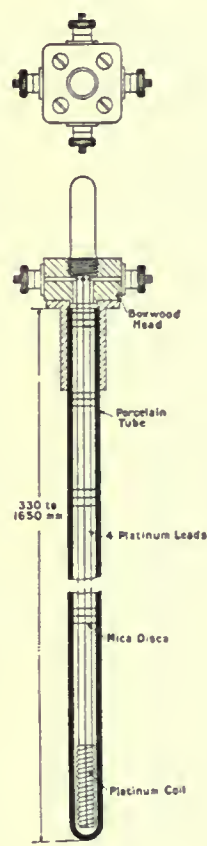


Fig. 2.

then read directly from the scale. The construction and operation of the instrument is seen from the accompanying illustrations, taken from the catalogue of the Cambridge Scientific Instrument Co. The principle of the instrument is easily understood by reference to Fig. 1. At *A* and *B* are shown the two compensating lead wires, introduced so that unequal heating of the leads may not affect the reading, the temperature read is therefore that of the coil. The temperature scale is on the bridge wire marked *D*. In the instrument as intended for use, galvanometer, bridge, etc., are within a portable carrying case, and the coil is within a refractory tube; the leads connecting this to the indicating instrument may be made as long as desired. For permanent work in one position the bridge, etc., are arranged to be attached to a wall, or other convenient object, and the instrument can then readily be made to keep a continuous record.

In Fig. 2 are seen the details of the construction of that part which is exposed to the action of the fire. The coil is wound as shown, upon mica discs, and the compensating leads are also shown. The porcelain tube is likely to become broken from rapid changes in temperature, and if the heat of the furnace is not too high a steel tube may be substituted. This latter is somewhat

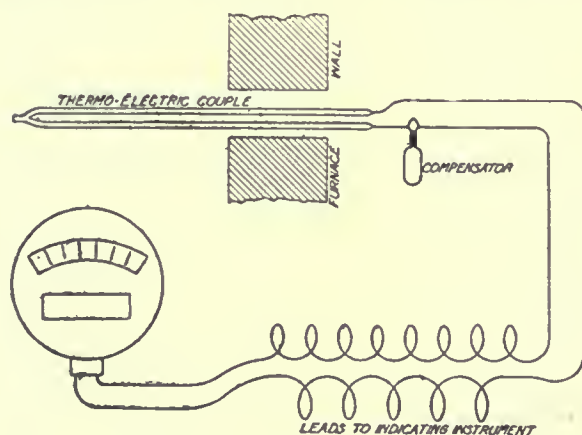


Fig. 3.—Thermo-Electric Pyrometer.

permeable to furnace gases, however, and as these are injurious to the platinum, in cases where they are likely to cause injury, an outer steel sheath and an inner porcelain one may be combined with advantage.

The objections to this method are the same as those given for the thermo-electric. It has no 'cold junction' as with the latter, but the batteries need attention to make sure that they have not become polarized, the possible error in this method being much more serious than with the former. The recorder is more complicated than that required for a thermo-electric couple, and does not cover as wide a range. Temperatures can be measured up to the softening point of platinum, but the makers do not recommend this type of instrument for continuous use above 900°C ($1,650^{\circ}\text{F}$). For accurate scientific work a potentiometer is generally used in place of the bridge. With proper precautions, electrical resistance is the most accurate method of measuring temperature. The bolometer, an instrument using this principle, will detect a difference of one-tenth thousandths of a degree.

The thermo-electric pyrometer is the method now most generally used in the United States. This instrument depends upon the fact that if wires of two dissimilar metals are connected through a galvanometer at one end, joined together at the other end, and the junction heated, an electric current will flow through them and be shown by the deflection of the galvanometer, the amount of

deflection being dependent upon the difference in temperature of the two ends of the wires, and also upon the nature of the wires. Suitable pairs of wires for this purpose are platinum and platinum alloyed with 10% of rhodium or iridium; platinum and silver; iron and nickel; copper and nickel; copper and an alloy of copper with 25% nickel, known as constantan; and various others. Ordinarily the copper constantan and platinum-rhodioplatinum couples are amply sufficient, as the latter will measure from 300°C up to the softening point of platinum, and the former from 500°C down to the lowest temperatures commercially attainable. Couples containing iron should be used with care, as above the change points in the iron they are necessarily inaccurate. These base-metal couples will not stand exposure to a high temperature, as oxidation seriously affects the readings.

This method is diagrammatically shown in Fig. 3. The galvanometer is of the suspended coil type, it is very delicate, and, consequently, requires careful handling. It should be carefully leveled before releasing the needle, and should never be moved while the latter is free, as this is likely to cause damage to the suspension. Before taking a reading it is necessary to make certain that the galvanometer needle reads zero when no current is passing; if this is not the case it is made to do so by moving a small projecting pin at the top of the suspension spindle. It must be kept in mind that what the

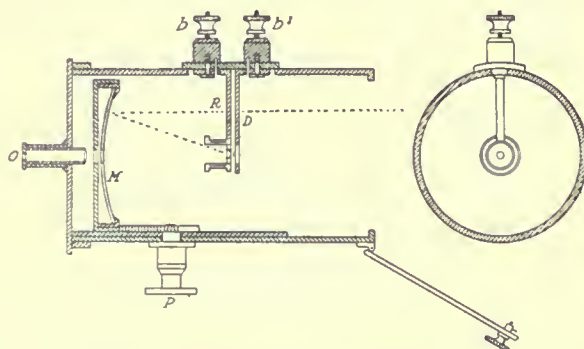


Fig. 4.—Fery Radiation Pyrometer Telescope.

galvanometer indicates is not the temperature of the junction, but only the difference in temperature between the hot and cold ends, consequently an allowance for the temperature of the cold end must be made in order to obtain the real temperature. Most of the galvanometers as supplied by the makers, tend to confusion in this regard, as they are calibrated to degrees as well as to millivolts. For rough work, where the couple is so long that the cold ends remain at the temperature of an ordinary room, the use of the scale on the face of the instrument will not cause serious error, but if the couple is short, or the construction of the furnace is such that it is impossible to prevent the outer ends of the couple from becoming heated, it will be necessary to measure the actual temperature of these ends, and make an allowance. With the copper-constantan couples the temperature of the cold ends is simply added to that corresponding to the deflection observed. In the case of the platinum-rhodioplatinum couples only one-half this temperature must be added, as these couples are only half as sensitive in their lower ranges as they are above. For a slight fee couples will be calibrated by the National Bureau of Standards at Washington, which will furnish a table of temperatures corresponding to deflections, throughout the range of the instrument.

It should be observed that the 'cold junction' is not where the wires are connected to the galvanometer, but where the couple wires are joined to the copper con-

ductors. The most convenient way to keep the junctions at a constant temperature is to immerse them in water containing ice, short-circuiting through the liquid being prevented by enclosing one of the wires in a glass test-tube. A convenient way when using the base-metal couples is afforded by the Bristol compensator, shown in Fig. 3. This is a platinum loop partly immersed in a tube containing mercury, the expansion of which is made to cut sufficient resistance out of the circuit to compensate for the increase in temperature of the cold ends.

The copper wires connecting the couple to the galvanometer should be amply large, otherwise their resistance will affect the deflection. Ordinary electric light cord serves very well for all ordinary lengths. When the proper connection to secure deflection in the right direction is secured, it is well to tie a knot in the cord going to the right hand binding post, or mark the connections in some way to save time in connecting afterward.

The three most important points in the use of the thermo-couple are to prevent short-circuiting, to protect the wires from the effects of hot gases, and to insure that the thermo-junction is brought up to the temperature of the furnace. The first is secured by passing the wires through double-bored clay tubes, $\frac{1}{8}$ in. diam., down to within three or four inches of the junction. A narrow strip of ordinary stove mica is then placed between the wires and a single-bored clay tube is slipped over them. To secure the second, it is necessary to enclose these tubes in another tube sufficiently long to pass completely out of the furnace, and sufficiently impervious not to let the furnace gases pass through it. If the temperature is not high, wrought-iron pipe (such as gas-pipe) is satisfactory. The pipe should not be capped on the inner end, but should be welded shut. With continued use it will become oxidized, and will need to be renewed. For high temperatures porcelain is ordinarily used, but it is likely to break from the sudden changes of temperature, or from shock; and in many cases, as in taking the temperature of molten baths of metals that alloy with the platinum, the breaking of the outer tube will cause the destruction of the couple. A better substance for this purpose is fused quartz tubing. This has practically no co-efficient of expansion, less than one-twentieth that of porcelain; consequently, it can scarcely be broken by heat. It is sufficiently resistant to use in molten baths, and is also cheaper than the porcelain. It can be obtained in any size. A quartz tube obtained by me from the Wilson-Maeulen Co. of New York has been subjected to trying conditions with entirely satisfactory results.

The necessity for protecting the wires of the couple from the furnace gases is due to the fact that there are slight impurities that are reduced by the action of the gases, and these produce a harmful effect such as they do not possess in their oxidized state. The necessity for protecting the wires from a metallic bath is obvious. If the wires have been strained it is necessary to anneal them; this is easiest done by passing a current of sufficient strength to heat them red-hot.

It is necessary to take proper care in introducing the junction into the furnace to obtain correct readings. The galvanometer will record the temperature of the junction with an accuracy far greater than required. But by improperly placing the couple, the reading obtained may be so far different from that which should be obtained as to render the results valueless. It is sometimes impossible to place the junction at the point desired. The point selected may differ to a surprising degree. In some experiments made in my laboratory a thermo-couple was introduced at the throat of a small reverberatory furnace, having a hearth area of about two and one-half by

four feet. When the thermo-couple read 750°C , temperatures were read on various points of the hearth with a radiation pyrometer. It was found that the hearth temperature varied from $1,050^{\circ}\text{C}$ near the bridge-wall to 750°C at the couple. This instance will serve to emphasize the importance of placing the thermo-couple at the point where the temperature is desired.

The thermo-couple is useful for a wider range of work than any other pyrometer. The platinum-iridioplutonium couple gives a more open scale than the platinum-rhodioplutonium, but can be used only up to $1,400^{\circ}\text{C}$, while the latter can be used up to $1,600^{\circ}\text{C}$. But if either of these couples are used continuously near their upper limits they will slowly deteriorate, the iridioplutonium by a slow distillation of the iridium out of the alloy wire into the pure one; the rhodium couple probably from the effects of the furnace gases. The point most apt to be neglected in practice is the proper protection of the wires from the furnace gases, and as the couple is expensive, lack of care in this regard proves costly.

For continuous service above $1,500^{\circ}\text{C}$, thermo-electric pyrometers are useless, and they are not satisfactory for ranges much below this, especially in certain places. The only pyrometers that are successful for these upper ranges are optical instruments. These are of two classes, those that depend on the photometric measurement of the light emitted by the hot body, and those that measure the heat radiated by it. There are several types of the former, but none of them are useful from the industrial point of view. In all of them the light emitted by a body is compared, either directly or indirectly, with the light of a standard lamp. In works practice the observer has neither time nor patience to make exact comparisons with standards; therefore, although these methods are capable of giving exact results in the laboratory, in works the determinations made by them are usually seriously wrong. In checking up with a radiation pyrometer some determinations made in a roasting furnace with a photometric pyrometer, it was found that the determinations of the latter were some 200°F in error at $1,600^{\circ}\text{F}$. One photometric instrument, which has received a good deal of attention, but which is especially unsatisfactory from the works point of view, is the Wanner.

The only remaining pyrometer of industrial importance is the Fery radiation pyrometer, which determines the temperature of a hot body by measuring the heat it radiates. This is based upon the law of Stefan and Boltzmann, that the energy radiated by a hot body is proportional to the fourth power of its absolute temperature. The construction of the instrument is shown in Fig. 4. The radiant energy of the hot body is received upon the mirror *M* and is reflected and brought to a focus upon the hot junction of delicate thermo-couple contained within *D*. Thus, in a manner somewhat similar to the operation of the burning glass, the temperature of the junction of the thermo-couple is raised, and by properly calibrating the galvanometer in circuit with the thermo-couple, the temperature of the hot body is read directly. On sighting through the telescope at the body whose temperature is to be measured, it is seen as two dissimilar halves until the mirror is brought to the proper focus by turning the thumb-screw, when the two halves will coincide. The only limitation as to the distance of the telescope from the hot body is that it shall be sufficiently near so that the image of the body in the telescope completely covers the thermo-junction; in practice this is about a yard for each inch in diameter of the body. With a large hot body it is thus easy to get far enough away from it so that the observer does not get burned, a rather necessary precaution in the case of large roasting

furnaces, fire-boxes of boilers, copper converters, etc. As ordinarily constructed the instrument measures up to $2,000^{\circ}\text{C}$ with an accuracy of 1%. By substituting a galvanometer of the proper resistance it has been used to measure the temperature of the sun ($7,800^{\circ}\text{Centigrade}$).

For the higher ranges of temperature this is the only satisfactory pyrometer for industrial work, and is more satisfactory than any other for many classes of work down as far as it will read accurately, which is about a dull red heat (500°C or 900°F), where, however, the radiant heat is forced to pass through clouds of smoke or dust. On their way to the mirror low results will be obtained, due to the absorption of the radiant heat.

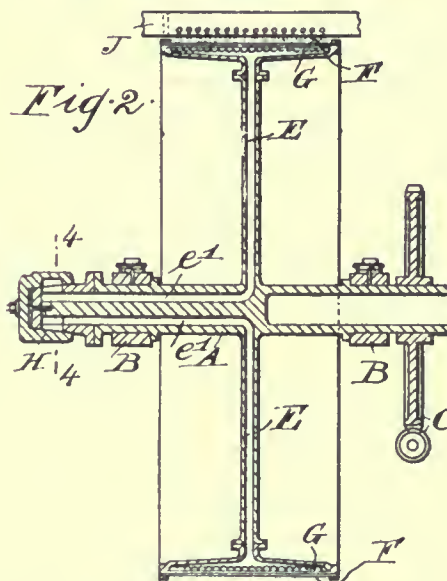
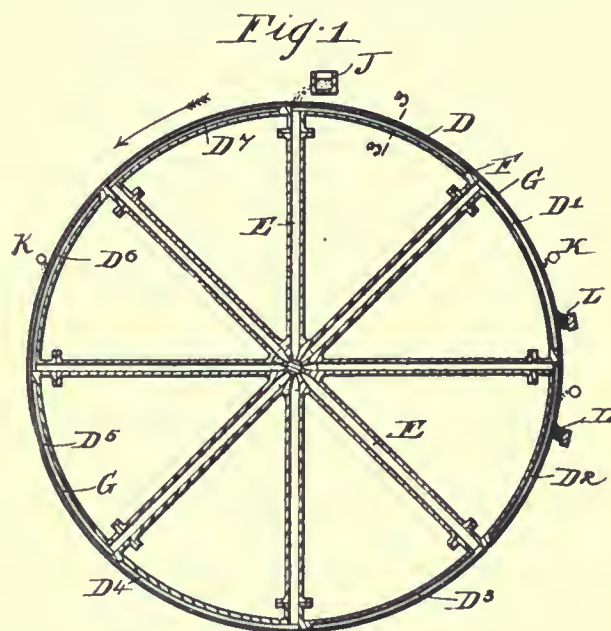
For determining the temperature in various parts of large roasting and casting hearths, fire-boxes, and porcelain kilns, and for determining the temperature of pots of molten metal before casting, I have not found any other pyrometer to compare with it in ease, quickness, and accuracy of observation. I have used it to determine the variation in the temperature of rabble shoes in their passage through the furnace. For permanent use the telescope is best sighted on the bottom of a fireclay tube set in the wall of the furnace, and in such case the mirror must be protected from dust. This is easiest done by completely enclosing the whole instrument.

Too much emphasis cannot be laid on the great saving effected through securing accuracy and economy of operation by the keeping of an accurate and constant record of the temperature of metallurgical operations. There is no better method of overcoming the irregularities of the night shift than a recording pyrometer. In one case known to me the output of a spiegel furnace increased 10% when the men learned that a recording pyrometer had been installed. In another case, where regenerators were used there was a perceptible saving from regularity of manipulation of the valves, as soon as the men learned that any irregularity was unerringly recorded. Similar instances might be multiplied, but it scarcely seems necessary to justify the statement that industrial pyrometry is one of the subjects of greatest present importance in the commercial world.

SOME new points have recently been emphasized regarding the conditions necessary to restore power from a moving car to the line, when single-phase electric motors are used on the cars. These are that the pressure generated by the motors must be greater than that of the line, and this pressure must be under control. There must, of course, be some power-consuming device on the line to take care of the power thus produced. The single-phase motor has characteristics which make it possible to meet these conditions. To obtain complete control of the system, a constant-potential characteristic of the motors operating as generators is desirable, and the motors must be able to run as generators when the relations between field and armature currents are not those which would obtain if they were operating as motors. In other words, it may be necessary for the armature current to be different from that in the field coils, and the commutating conditions will therefore not be those which would exist if the machine were running as a motor. Commutation under these conditions must for this reason be provided for, if successful regeneration is to be obtained. The single-phase motor has a compensating winding which takes care of commutation, and the constant-potential characteristic is obtained by separately exciting the motors, which may be done by reserving one motor of the equipment as an exciter, or by providing some independent source of excitation. Control of the potential generated by the equipment is obtained easily by means of a regulating transformer.

Slime Treatment.

In our issue of November 9, we published a letter from Mr. Askin M. Nicholas, sent by him to us under date of July 5, 1907, from Talmalmo, in New South Wales. In that letter he referred, modestly enough, to his invention of a machine for filtering slime and his bad luck in getting it introduced successfully into milling practice. We published the letter and a part of the drawings accompanying his specifications for patent. Since then it has been pointed out to us that the patent is an important one and interesting to cyanide specialists. Therefore, we now publish the text of the specifications forming part of Patent No. 619,211, granted by the



United States Patent Office to Mr. Nicholas in February, 1899. The reference to the use of air under pressure in the treatment of "adhesive material, such as clay," is important. The text (without any corrections) follows:

FILTERING APPARATUS FOR SEPARATING GOLD AND SILVER BEARING SOLUTIONS.

Specification forming part of Letters Patent No. 619,211, dated February 7, 1899.

Application filed November 11, 1898. Serial No. 696,416. (No model.)

To all whom it may concern:

Be it known that I, ASKIN MORRISON NICHOLAS, mining manager, a subject of the Queen of Great Britain, residing at Bulong, in the British Colony of Western

Australia, have invented an Improved Rotating Filtering Apparatus Principally Applicable for the Separation of Gold and Silver Bearing Solutions from Tailings, Slimes, and the Like, of which the following is a specification.

This invention has been devised for the purpose of providing means whereby solids or insoluble material may be separated from liquids carrying same in suspension, but more particularly for the purpose of providing means whereby the separation of gold and silver bearing solutions from tailings, slimes, pug, or pulverized ore may be carried on continuously and in such a way that a clean or partially clean filter-cloth will be continuously brought into operation without necessitating stoppages for recharging, as required with the appliances at present in use.

The essential feature of the invention consists in the use of a rotating wheel, disk, or table formed with a series of air-tight compartments covered with cloth or other filtering material supported upon a metal screen or perforated plate and adapted to be automatically placed in communication with a vacuum-pump in turn for a sufficient time to enable the liquid to be drawn through the filtering material, leaving the solid constituents upon the filtering-surface, whence they can subsequently be removed by brushes, jets of water, scrapers, or similar contrivances, provision being made for automatically allowing air to enter into the various compartments at the desired period of the operation to facilitate the removal of the solids from the outer surface of the filtering material.

The invention will more readily be understood by reference to the accompanying drawings, in which—

Figure 1 is a vertical central section, and Fig. 2 a vertical transverse section, of a rotating filter constructed according to this invention. Fig. 3 is a cross-section through the rim of the rotating filter on line 3 3, Fig. 1, the scale being enlarged. Fig. 4 is a transverse section on line 4 4, Fig. 2, upon an enlarged scale, illustrating the construction of a valve hereinafter described. Fig. 5 is a front elevation of a modified form of my invention. Fig. 6 is a vertical transverse section on line 6 6, Fig. 5. Fig. 7 is a front elevation, upon an enlarged scale, of the inner face of the valve used with this form of apparatus; and Fig. 8 is an end view, upon an enlarged scale, of the shaft or spindle, illustrating the arrangement of certain ports or passages therein.

The same letters of reference indicate the same or corresponding parts in all the figures.

The arrangement illustrated in Fig. 1 to 4 consists of a wheel—say twelve feet in diameter and four feet breast—mounted upon a shaft A, rotating in bearings B. This wheel may be driven at a speed of, say, from one to five feet per second at the periphery by worm and worm-wheel gear C or otherwise. The wheel is made with a number of compartments on its periphery (marked D to D7), each communicating with one of the hollow spokes E and covered with filter-cloth F or other material resting upon a screen G, of wirework or perforated sheet metal.

Each of the hollow spokes E is in communication through ports or passages *e'* in the axle A with a stationary valve H, communicating through a suction-pipe *h'*, with a suction-pump. This valve H is constructed and arranged, as illustrated in Fig. 4, so as to place only two of said hollow spokes E in communication with said suction-pump at the same time. Said valve is provided with a small air-admission cock I, whereby air may be admitted to each hollow spoke in turn as it passes said valve. This enables the solid material to be more easily removed.

J represents a distributing-launders for feeding the slimes, tailings, or other material onto the filter, while K K represent perforated water-supply pipes whereby jets of water may be delivered onto the filtering medium in order to remove the solid particles therefrom. L L represent brushes which can also be used for this purpose.

In using the above-described apparatus the material to be filtered or from which the liquid is to be extracted is fed by the launder J onto the upper part of the wheel—say, for instance, onto the compartment D. As the wheel continues to rotate in the direction of the arrows shown in Fig. 1 this compartment will be placed in communication through its spoke E, port or passage *e'*, and the valve H with the suction-pump, whereby the gold and silver bearing solution or other

liquid will be drawn through the filter and delivered into storage-tanks or elsewhere, leaving the solid constituents on its surface. This operation will be continued until the material has been carried around through about one-fourth of a revolution of the wheel, when the valve H will shut off the compartment from the vacuum-pump, and the solid material can then be removed by washing or brushing it off the surface. This operation can be assisted by the admission of air through the valve I, and if adhesive material, such as clay, has to be treated air under pressure can be forced into the compartment through said valve, as will be readily understood.

Where necessary, water may be added to the partially-dried slimes or other material while on the surface of the filter and be drawn through into the vacuum-chambers in the wheel, so as to still further impoverish the residues.

The invention is also applicable for the recovery and reuse of water from ordinary battery-tailings. In such a case there is no necessity to use water-jets to remove the sand from the filter, as it does not adhere closely thereto and can be removed by brushes alone.

In the arrangement above described the sludge is shown as distributed upon the top of the wheel; but it is obvious that the slimes or other material can be brought into contact therewith at any desired part. For instance, the arrangement illustrated in Fig. 5 and 6 may be used, the various vacuum-compartments being formed in sections upon the face of the disk or table instead of on the periphery and the slimes being fed onto it through jets J, as indicated in said figures. In this arrangement the wheel is shown as being driven by an endless rope C instead of the worm and worm-wheel gear above described; but it is obvious that any convenient form of driving-gear may be employed.

In operation the flow of pulp onto the rotating filter is continuous from the vessel in which it is stored. The speed of the filter and the rate of supply thereto are regulated so as to keep the film of solid material just sufficiently thick as not to resist the external atmospheric pressure.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is—

1. In a filtering apparatus, the combination with a rotating wheel having a series of peripheral compartments covered with filtering material upon their outer, or circumferential faces, each compartment communicating by a hollow spoke with a separate passage in the axle or shaft, an exhaust-pipe with which a part only of the latter passages have communication at the same time, and means for feeding the material to be filtered upon the upper portion of the revolving wheel, substantially as described.

2. In a filtering apparatus, the combination with a revolving wheel having peripheral closed compartments and provided with a circumferential covering of filtering material, of an exhaust-pipe having one end open to a portion of the wheel-shaft and successively communicating with separate longitudinal passages in said shaft as the wheel revolves, a series of hollow spokes leading from said shaft-passages to the peripheral compartments, means for feeding the substance to be filtered upon the filtering material on the upper side of the wheel as the latter revolves, and water-supply pipes to spray water upon said substance, substantially as described.

3. In a filtering apparatus, the combination with a revolving wheel having separate closed compartments on its periphery and provided with a circumferential covering of filtering material, of a shaft having a number of separate longitudinal passages, a series of tubular spokes placing said passages in communication with the peripheral compartments, an exhaust-pipe having one end brought into communication with a plurality of the passages in said shaft as the wheel revolves, means for feeding the substance to be filtered upon the upper side of the wheel and upon the filtering material as the wheel revolves, pipes to spray water thereon, and brushes to remove the residue of said substance after the separation is effected, substantially as described.

ASKIN MORRISON NICHOLAS.

Witnesses:

CHARLES CLARK,

HARRY HALE.

The Burt Rapid Cyanide Filter.

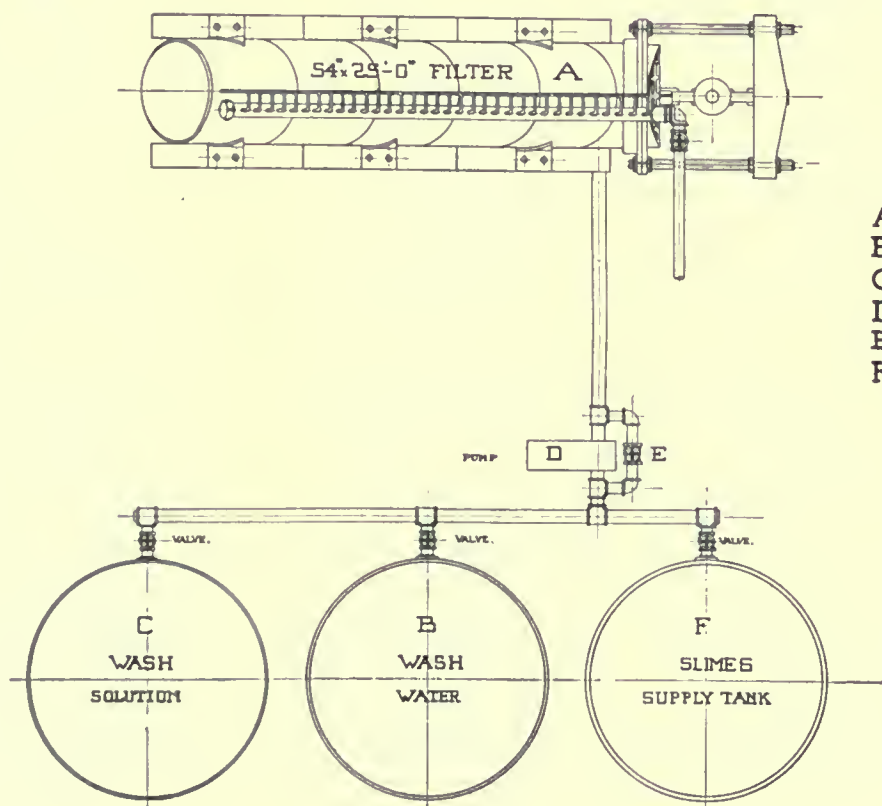
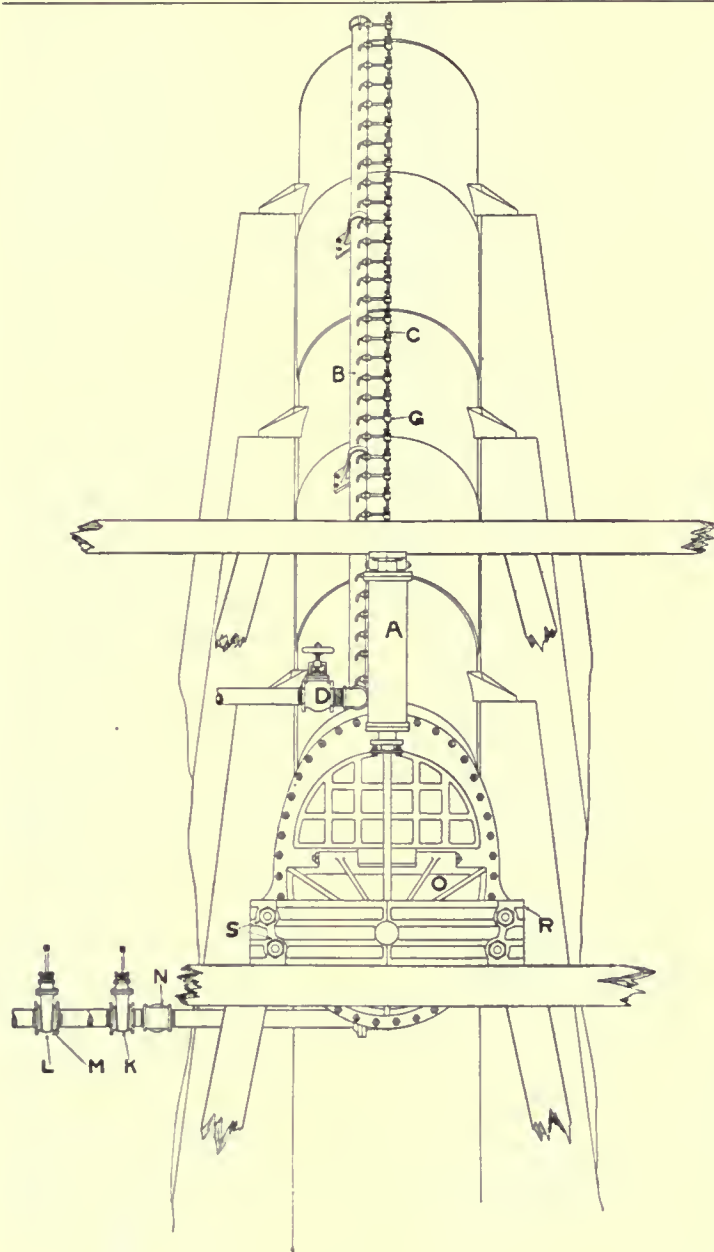
Written for the MINING AND SCIENTIFIC PRESS
By E. BURT.

At the plant of the El Oro Mining & Ry. Co., after the erection of the second 100 stamps known as Mill No. 2, it was decided to treat all the sand and slime in the new cyanide plant, where they could be handled more advantageously with the larger units.

When this change was made, and with the aid of tube-mills for fine grinding, there were produced 550 to 600 tons of slime to be handled daily. This slime is handled entirely by the decantation process, and owing to crushing with cyanide solution in the batteries, a large amount of solution per ton of slime treated has to be precipitated daily. This amount is 9 tons of solution to 1 ton of slime. Of the five washes given to the slime, the first is mill solution collected with the slime, which with the next three washes are run to the precipitation boxes, while the fifth wash is run to the mill-solution vats. With all of this washing, and the slime being discharged with only 40% moisture, there was still a difference of 10 to 15 cents gold and one to two tenths of an ounce silver between the samples of washed and unwashed slime-discharge. Aside from the loss in dissolved metal there was a small loss in cyanide.

With the idea in view of cutting down these losses, and also of treating the slime with a smaller proportion of solution per ton of slime, experiments were started to see what could be done by filter-pressing. After trying two different systems on a small scale it was decided to work out a system where gravity pressure could be utilized, and after a great amount of work and experimenting a cylinder type of press was evolved.

This press consists of a cylinder pivotally mounted or set in a fixed position at an angle of about 45°, with large door at its lower end.



- A-BURT PRESSURE FILTER.
- B-WASH WATER TANK.
- C-WASH SOLUTION TANK.
- D-FORCE PUMP.
- E-BY PASS.
- F-SLIMES SUPPLY TANK.

It carries a series of filter-mats, swingingly suspended on its interior, each mat having a connection which passes through the shell to a main solution-pipe fixed to its exterior. These mats consist of two sheets of heavy canvas enclosing a core of cocoa-matting or burlap. The edges of the canvas are lapped over and sewed so as to enclose a perforated pipe bent in the shape of an ellipse. The ends of this pipe almost meet in a special T, which is held rigid against the interior of the shell, and the perforated pipe turning in the T allows the mat to swing. The door at the lower half of the end of the cylinder is of such dimensions that the opening is equal to one-half the area of the end. It is made large to allow easy exit of the slime without the use of much water. An 18-in. valve was used on a 3-ft. cylinder, and it was found that the hard cake of slime would bank up against the shoulders and not discharge. A door of liberal dimensions allows the changing of cloths without taking off the cylinder-head. The door is opened and closed by an arrangement of toggles operated by a hydraulic or air-cylinder. The toggles work against a cross-head, which in turn is held in place by side-rods bolted to the head of the cylinder. On the bottom side of the cylinder near the door is placed the one connection for admitting slime, wash-solution, or wash-water, and for displacing any surplus slime or washes. There is a valve on the main solution-pipe on top of the press, and an air-connection to the pipe. To the top of the cylinder is fastened an air-connection. For operating the press the valves are so arranged with different connections for slime-feed by gravity from the surplus vat, or for wash-solution or water, that they can be operated by one man. To operate the press (referring to the accompanying illustration) the slime is forced in under a pressure of from 40 to 60 lb., until a cake *H* of the desired thickness is formed on the mats. Then the slime-valve is closed and the air-valve *F* and the discharge valve *M* are opened. Air at a low pressure is admitted to the shell and forces out all of the soft slime, and at the same time this pressure keeps the cakes in place. All this material flows back to the slime-supply vat. The discharge-valve is then closed and wash-water is admitted. After a sufficient length of time the wash-water is shut off and air is admitted to the shell again, until all of the excess liquid is displaced, and a large part of the moisture in the cakes is driven off. The solution-valve *D* is then closed and air at a low pressure is admitted to the pipe *B*, and through its connection to the filter-mat pipes, thus causing the cakes to drop off and slide out of the shell. Before kicking the cakes off the mats the door *O* is opened by means of the hydraulic cylinder *A*, the first and upward motion of the piston-rod draws the toggles out of position, and a continuation of this motion draws the door open sufficiently to allow the material to slide out of the shell. If the press is being operated by gravity pressure there is a small amount of surplus slime run to the vat. For the next operation this surplus slime is first pumped into the press, partially filling it, then the pump is stopped and the gravity slime-feed valve is opened and the operation carried on as before. Another method of operating is to fill the shell with slime and then shut the slime-feed valve and let in wash-solution, when all of the slime will form cakes; then the washing or treatment can be continued as long as desired. This wash-solution may be displaced with air, which gives an 'air leaching' to the slime, and then the washing may be continued again, if desired.

If a low air-pressure is maintained against the cake of slime it will not crack, but if the pressure is raised to 10 or 20 lb., or a 15-in. vacuum be maintained on a cake, it will crack. It has been found that an air-pressure of 10 lb. can be kept on a 1½-in. cake for 10 minutes, and then

by introducing a slimy wash-water the slime will immediately fill the cracks, and then the washing proceeds as usual. Using a pressure of 50 lb. it requires about ½ minute to fill the crack in the cake, and to complete the total washing 15 to 20 min. The time occupied in filling the cracks is about ½ minute when using 50-lb. pressure.

The following data give the time of the different operations and value of wash-solutions coming from the cake, also washed and unwashed sample of residue:

No. 1.

Operation.	Minutes.
Forming cake.....	5
Displacing slime and entering wash-water.....	22
Total time	27

Cake 1½ in. thick, made at 75-lb. pressure; wash-water used per min., 60 gal. at 90-lb. pressure.

SOLUTION ASSAYS.

	Gold.	Silver.
Solution from making cake.....	\$1.66	0.4 oz.
Wash-water after 2 minutes.....	0.54	Trace
" " 4 "	0.31	"
" " 6 "	0.28	"
" " 8 "	0.20	"
" " 10 "	0.10	"
" " 14 "	0.16	"
" " 16 "	0.10	"
" " 18 "	0.06	"
" " 20 "	0.01	"
" " 22 "	Trace	"
Moisture out of cake	"	"
Heading	7.50	2.50
Tailing	0.52	1.95
Tailing washed.....	0.57	2.00

Moisture in cake 28 to 30%. Amount in one charge 1.75 tons.

No. 2.

Operation.	Minutes.
Forming cake.....	7
Displacing slime.....	4
Washing	20
Displacing wash-water and emptying.....	4
Total time.....	35

Cake 1½ in. thick, made at 75-lb. pressure; wash-water used at 90-lb. pressure.

SOLUTION ASSAYS.

	Gold.	Silver.
Solution from making cake.....	\$1.66	0.4 oz.
Wash-water after 3 minutes.....	0.64	0.2
" " 7 "	0.18	Trace
" " 10 "	0.12	"
" " 15 "	0.06	"
" " 20 "	0.02	"
Moisture in cake.....	Trace	"
Heading	7.50	2.50
Tailing	0.47	1.95
Tailing washed	0.57	1.90

Moisture in cake 28%. Amount treated in one charge 1.75 tons.

No. 3.

Operation.	Minutes.
Forming cake.....	8
Displacing slime	3
Washing	15
Displacing wash-water	4
Total	30

Cake 1½ in. thick, made at 75-lb. pressure; wash-water per minute 60 gal. at 90-lb. pressure.

SOLUTION ASSAYS.

	Gold.	Silver.
Solution from making cake.....	\$1.66	0.4 oz.
Wash-water after 5 minutes.....	0.30	Trace
" " 10 "	0.16	"
" " 15 "	0.08	"
Moisture out of cake.....	0.10	"
Heading	7.50	2.50
Tailing	0.52	2.00
Tailing washed.....	0.52	1.90

Moisture in cake 29%. Amount treated in one charge 1.75 tons.

The condition of the filter-mats can be readily told by closing the cock in the branch pipe, connecting to the solution-pipe, and opening the little pet-cock on top of the T. A battery of these presses can be operated as a single unit or separately; any one of them may be cut out to change cloths. The cloths last about six months and require acid treatment once a month. The life of the cloth may seem short, but when the following figures are

examined it will be seen that each cloth has a large capacity from using a pressure of 40 to 60 lb., thus:

Size.....	42 in. by 20 ft.
Weight, in pounds.....	12,800
Capacity, in tons of dry slime per 24 hr.	120
Number of mats.....	28
Area one side of mat, in sq. ft.....	8
Total volume of shell, in cu. ft.....	208.8
Total volume of mats, in cu. ft.....	6.3
Total volume of cake 2 in. thick, in cu. ft., moisture 28%, 110 lb. per cu. ft.....	74.6
Total amount slime to fill shell, in cu. ft., moisture 63%, 82.2 lb. per cu. ft.....	292.5
Volume of excess slime, in cu. ft.....	127.9
Volume to pump to make cake, in cu. ft., moisture 60%.....	144.0
Total volume to pump, in cu. ft.....	336.5

Operating expenses per ton of dry slime, 4 c. gold when using gravity-pressure, and 8 cents using pump.

The amount of surplus slime to be handled at each operation is 39% of the total slime run into the press.

The time of making a cake is so short that there is no settlement of the sandy portion, if there be any. After one or two operations, and measuring the cake, a definite number of minutes can be used as a criterion, so as to make the same thickness of cake. If the slime is very thick the cake will form quicker, but it will not be so compact as when made with a more dilute slime. The solution-filter is built on the same plan, except that there is no discharge-door, and the cloths are placed as close together as the connections will allow. The entire space inside the cylinder is occupied with cloths, except a few inches under the cloths to allow for sluicing out the thin cake that drops.

One of these presses, 54 in. by 17 ft., with 70 cloths, recently installed in the mill of the Mexico Mines of El Oro, has been filtering 2,400 tons of solution per day for 30 days and has only been cleaned once, and that was when a decanting-pipe was dropped, allowing slime to get into the filter.

A NEW METHOD of determining azimuth has been developed that is believed to possess certain advantages on the score of simplicity, in those cases where only a moderate degree of precision is sought. The especial merit of the method is that it requires no knowledge of the time or latitude, either for the observation or for the subsequent calculation. While a watch is used in the observation, its sole purpose is to measure an interval of a few minutes, and the watch may as well be wrong by any amount as to be right. The method involves observations on Polaris and one other star not near the pole, which for convenience may be called the 'time-star.' The distinctive feature of the method, and the only one for which any novelty can be claimed, is that the interval between the observation on the time-star and that on Polaris is made such that the hour-angle on Polaris is either the same as that of the time-star or different from it by 12 hr., but it is quite unnecessary to know what the hour-angle is. In order that the interval between observations may not be inconveniently long, the time-star selected should have a right ascension either a few minutes less than that of Polaris, or a few minutes less than that of Polaris increased by 12 hours.

AUTOMOBILES valued at more than 10 million dollars passed through the ports of the United States in its foreign trade in the fiscal year just ended. Five and a half million dollars' worth of these were exports and 4½ million dollars' worth imports. In addition to the 5½ million dollars' worth of automobiles exported to foreign countries, about \$100,000 worth went to Porto Rico, \$160,000 worth to Hawaii, and about \$5,000 worth to the Philippines. The United States occupies second rank among the commercial nations as an exporter of automobiles, being exceeded only by France.

The Prospector.

Enquiries sent to this department are answered free of charge, if submitted by subscribers who are not in arrears. The full name and post-office address of the sender must be given, otherwise no answer will be made. Those who are not subscribers must accompany their questions with a fee of \$3 for each question. No assays are made.

C. L. L., of Millers, Nev., sends Anglesite.

J. P., of Eureka, Nev., sends impure Lignitic material.

Specimens of Graphitic Schist were received from B. N. S., of Orient, Washington.

G. E. R., of Barstow, Cal., sends a specimen of massive red Garnet and green Pyroxene.

A specimen of Muscovite Schist of no value was sent by W. C. F., of Benson, Arizona.

The two minerals from Salome, Ariz., are: No. 1, lamellar Hematite; No. 2, Magnetite.

Specimens sent by W. H. S., of Lundy, Cal., are: No. 1, 2, and 3, Pyrrhotite in quartz; No. 4, Pyrite in quartz.

The specimen from W. H. B., of Valdez, Alaska, is mainly Pyrrhotite in quartz, and a small amount of Chalcocite and Molybdenite.

The rocks sent by H. N. S., from Mexico City, are: No. 1, Graphite and Pyrite; No. 2, Olivine Basalt; No. 3, Olivine Basalt; No. 4, Olivine Basalt stained with hematite; No. 5, basaltic Pumice.

R. I. G., of Fairview, Nev., sends: No. 1, Hornstone; No. 2, Syenite; No. 3, Rhyolite; No. 4, metamorphosed volcanic; No. 5, altered volcanic; No. 6, Quartz Porphyry; No. 7, Feldspar Porphyry; No. 8, altered Porphyry; No. 9, Quartz with graphitic specks.

Specimens marked S. T., from Tonopah, Nev., are: No. 1, Mica-schist; No. 2, Slate; No. 3, Green Fluorite; No. 4, Mica-schist; No. 5, Schist; No. 6, Serpentine and Tale; No. 7, Mica-schist; No. 8, Carbonaceous Schist; No. 9, Mica-schist; No. 10, Schist; No. 11, Quartz with Molybdenite; No. 12, Mica-schist.

The specimens from Mogollon, New Mexico, marked A. G. P., are: No. 1, Quartz-talc rock; No. 2, kaolinized Rhyolite; No. 3, Quartzite; No. 4, Quartzite; No. 5, Quartz; No. 6, cellular Quartz; No. 7, Quartz with Malachite; No. 8, Quartz and Wollastonite; No. 9, Quartz and Argentite; No. 10, altered Zeolite, stained by Hematite.

The specimens received from W. L. G., of Fairview, Nev., are: No. 1, Hematite; No. 2, Quartz Porphyry, stained by oxides of iron; No. 3, Quartz Porphyry; No. 4, Rhyolite; No. 5, Feldspar and Chlorite; No. 6, Quartz Biotite Dacite; No. 7, Garnet in quartz; No. 8, Quartzite with oxidized Pyrite; No. 9, Stibnite; No. 10, Garnet and Molybdenite; No. 11, Quartz with red Hematite; No. 12, Pyrite and Sphalerite in quartz.

The specimens from Manhattan, Nev., marked G. J. G., are: No. 1, Bornite in Epidote rock; No. 2, Talc Schist with Malachite; No. 3, Chloritic rock with Calcite vein; No. 4, Metamorphic rock stained by Hematite; No. 5, Quartzite; No. 6, Quartzite stained by Epidote and Iron; No. 7, Metamorphic; No. 8, decomposed rock stained by Iron Oxide; No. 9, Serpentinized rock with Malachite stains; No. 10, Chalcocite and Chrysocolla.

Electric Zinc Smelting.

By FREDERICK T. SNYDER.

*Iron, copper, and lead are smelted in bulk in single furnaces, putting through from 200 to 500 tons in each 24 hours. The reason why zinc ore cannot be smelted in an iron or lead blast-furnace is well known—the oxygen of the blast burns the reduced zinc back to oxide as fast as it is formed. In such furnaces the object, and the only object, of the blast is to furnish heat by burning the coke in the charge. If this heat be put into the stack by means of an electric current, as it is put into the filament of an incandescent light, the blast is not required and zinc as reduced will remain metal and may be condensed and removed.

Without going into the technical details of this electric stack method, I may say that these furnaces look substantially like an ordinary lead or copper water-jacketed furnace, but are provided with electrodes for carrying electricity in place of the tuyeres for carrying a blast. The ore is fed at the top and is entirely melted down, the residues being tapped as slag. The zinc condenses on the inside of the walls as spelter and runs down and is drained off. No blast is used, all the heat being put in with an electric current.

This solution, simple as it is, required an unexpected length of time to be put into a practical operative apparatus, but has now reached a form where we are warranted in considering what it means commercially to the mine owner. It is an economic truth that in the long run improvements in process accrue to the benefit of the owners of raw material. Excessive smelting profits soon attract new capital which reduces the net return to a normal interest basis. But no amount of investment can increase the grade of mineral in a deposit. To render the lower grade available for shipment a reduction must be made in the total cost of extracting and delivering the contained metal to the consumer.

For the purpose of arriving at definite figures, we can consider the result of two plants, each of 25,000 tons annual capacity, operating under equivalent traffic conditions in the Illinois coalfield, one using retorts and the other an electric stack furnace. Incidentally it may be remarked that single electric zinc furnaces of 50,000 tons annual capacity now appear practical.

The first cost of the present type of retort plant, including land, buildings, and machinery, but excluding working capital, will be some \$400,000. The equivalent first cost of the electric stack plant, including steam-driven electric generating machinery, will be substantially the same. Of this \$160,000 is the cost of the stack plant and \$240,000 the cost of the electric generating plant. Where current can be purchased from an existing power plant, the total cost of the electric stack plant is considerably less than half the cost of a retort plant. General operating cost for salaries, interest, and depreciation are substantially the same for the retort plant and the electric stack furnace.

The operating cost item of labor in a modern retort plant burning coal with mechanical roasters may be taken at \$4 per ton of raw ore. The labor in a stack plant may be kept well under \$3 per ton. While this result might naturally be expected from using one compact vertical iron-jacketed furnace in place of 2,000 horizontal clay retorts, it also depends on items not so obvious. The area of the stack plant is much smaller and distances over which material has to be handled are less and the continuous treatment admits the introduction of ore-handling machinery. With the electric stack furnace the sulphur

does not have to be roasted as low as with retorts; 6% of sulphur in the electric stack furnace will give as good an extraction of zinc as 1% sulphur with retort furnaces. This practically doubles the duty per square foot of hearth area of the roasters. The weight of the stack slag is less than one-half the weight of the retort residues and less than one-quarter of the bulk. The results of operating the electric stack furnace are to a large extent independent of the skill of the furnace-men, being determined, as in lead and copper smelting, by the metallurgist. This renders the electric stack plant, when starting up or in the event of labor troubles, much less dependent on a supply of specially skilled employees.

Considering fuel, it may be taken that a regenerative retort plant will burn 4,200 lb. of coal per ton of raw ore. Of this 600 lb. will be used in roasting. With the electric stack furnace it takes 1,200 hp. hours of electricity per ton of raw ore, or 50 hp. per day of 24 hr. The Fisk Street station of the Chicago Edison Co. is delivering one horsepower for one hour in electricity at the switchboard with the consumption of less than 1½ lb. medium grade coal. This amounts to 1,800 lb. of coal per ton of zinc ore and is practically constant whether the ore is high or low in zinc. So, aside from roasting, the electric stack plant uses one-half the coal that a retort plant uses. As roasting for stack smelting takes less than one-half the coal that roasting for retort work requires, the total coal consumption of the electric stack plant is not more than one-half that of the retort plant. The saving is substantially one ton of coal per ton of ore, amounting to 75 cents.

With the retort plant 800 lb. of reduction material will be used per ton of raw ore; with the electric stack plant 200 lb., assuming in each case a furnace charge carrying 50% zinc. With normal prices this saving amounts to 55c. per ton of raw ore.

With the electric stack plant there are no clay retorts and all cost items incident to their manufacture are absent. The items involved in the supply of new retorts amount to 40c. per ton of raw ore. With a stack plant, however, an item of expense is present which is absent in a retort plant. To smelt 25,000 tons of ore will require 100 tons of electrodes, costing \$50 per ton delivered, which is equivalent to 20c. per ton of raw ore.

Repairs and renewals on iron work and machinery will be substantially the same in each plant.

Summing up these differences of operating costs, it appears that the electric stack plant costs \$2.50 less per ton of raw ore to operate than the retort plant.

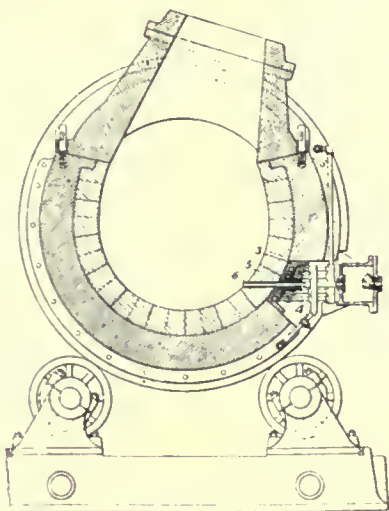
SALE OF COPPER.—Within the past year or 15 months there has been a number of changes effected in the agencies through which some of the leading copper producers of this country dispose of their metal. The most important of these are the transfer of the Baltic output now included in Copper Range from the American Metal company to the United Metals Selling company, the shifting of W. A. Clark's Montana product from the Vogelstein agency to the American Metal company, and the acquisition of the Bingham Consolidated output by the Vogelsteins from the United Metals company. The product of the United Verde, formerly handled by L. Vogelstein & Co., is now sold by W. A. Clark through his manufacturing concern in New Jersey, the Waelark Wire company. While the American Smelting & Refining Co. sells about 60,000 lb. through the United Metals company, the Guggenheims sell annually through the American Smelting Securities Co. approximately 30,000,000 lb. This includes the output of the Tacoma Copper company, formerly sold through L. Vogelstein & Co.—*Boston News Bureau.*

*Abstracted from *Transactions of the Tristate Mining Association.*

MINING AND METALLURGICAL PATENTS.

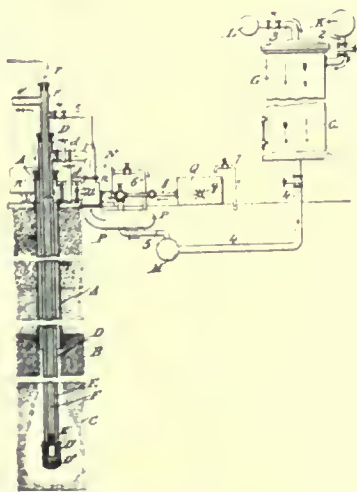
Specially Reported for the MINING AND SCIENTIFIC PRESS.

CONVERTER.—No. 870,925; Ralph Baggaley, Pittsburg, Pennsylvania.



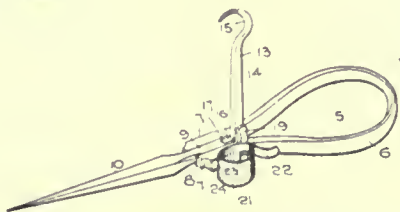
A copper converter composed of a refractory lining, heavy metal blocks forming the exterior walls, and a water-cooled tuyere block inset into the metal blocks and against the outer surface of said lining adjacent to and around the tuyere orifice; substantially as described.

MINING SULPHUR.—No. 870,620; Herman Frasch, New York, N. Y., assignor to The Frasch Sulphur Process Company, Kittery, Me., a Corporation of Maine.



The improved process of fusion mining in porous deposits, which process is characterized not only by the introduction of fusion fluid into an underground porous deposit of fusible material and by the removal of the melted material therefrom, but also by the introduction of comminuted material into said deposit in order thereby to restrict the freedom of movement of said fusion fluid in the deposit, substantially as described.

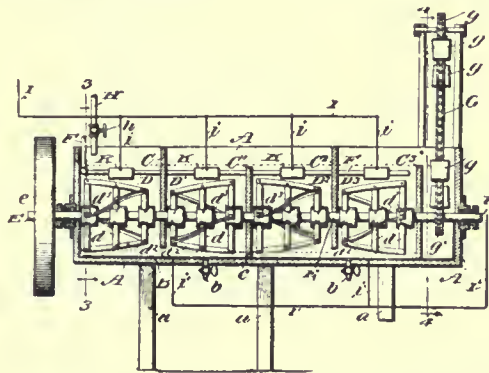
MINER'S CANDLESTICK.—No. 870,638; Guy D. Neill, Denver, Colorado.



In a miner's candlestick, the combination of an expandible yoke having normally parallel, longitudinally grooved jaws, and a pair of pivotally connected supporting devices,

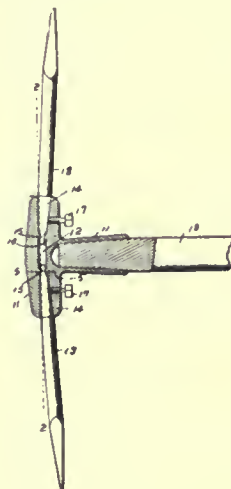
pivotally positioned within the grooves, the said yoke being adapted to pinchingly retain the said devices in their adjusted positions.

AMALGAMATOR.—No. 870,643; George E. Paullins, Colorado Springs, Colorado.



The improved apparatus for the purpose specified comprising a wooden trough having its rounded bottom lined with copper, and provided with a series of transverse partitions, alternate ones extending to the bottom and terminating below the top of the trough, and others terminating above the bottom of the trough and extending to the top thereof, a shaft passing through the longitudinal centre of the trough, a series of agitators keyed thereon, and comprising radial arms and strips connecting their outer ends, an endless conveyor arranged in the last compartment which is adjacent to the last of the series of agitators, a perforated pipe arranged along one side of the trough for delivering mercury into the several compartments containing the agitators, a pipe arranged for discharging a saline solution into the trough, and electric-circuit connections comprising conductors extending to a source of electric supply, one of said conductors being connected with the copper lining of the trough, and the other with plates arranged in the trough, as shown and described.

MINER'S PICK.—No. 871,058; William Donaldson and Elmer E. Donaldson, Moingona, Iowa.



A miner's pick, comprising a head having a handle socket formed on its under side, and having a transverse slot through its central portion, and two tapered openings extended from the ends of the head toward said transverse slot, and flattened openings extending from the tapered openings to the interior of the transverse slot, and two detachable pick points, each having a round tapered end portion with a flattened portion at the inner end of each tapered end portion, said pick points inserted in the tapered openings with the flattened portions thereof projected through the flattened openings and into the transverse slot, said head shaped to protect the adjacent ends of the pick points and to completely cover them, said pick points being so arranged within the head that they may be jointly driven from the head by a wedge passed through the transverse slot.

Books Received.

The Canadian Mining Journal issues a handsome volume commemorating the visit of the American Institute of Mining Engineers to Cobalt and Sudbury. A large number of excellent illustrations and some neat maps give additional value to the publication. Price, post-paid, \$1.

'Principles of Reinforced Concrete Construction,' by F. E. Turneaure, Dean of the College of Engineering, and E. R. Mauser, Professor of Mechanics, University of Wisconsin. Published by John Wiley & Sons. 8 vo., viii + 317 pp., 11 plates, 130 figures. Price \$3. In this, the latest book on this subject, a full treatment is given of the principles of mechanics underlying the design of reinforced concrete, together with the results of all available tests made in attempts to determine coefficients and working stresses; it also describes and gives detailed drawings of the latest forms of reinforcement of concrete. For sale by the MINING AND SCIENTIFIC PRESS.

'A Manual of Fire Assaying.' By Charles H. Fulton, President of the South Dakota School of Mines. 8vo. 178 pp. Published by the Hill Publishing Co., New York. This makes another of the many treatises on this subject; but this is one of the best, for it has been prepared by an experienced assayer and teacher. The book is confined closely to the subject of fire-assaying and treats of it in great detail. The chapters on 'Reduction and Oxidation Reactions,' 'Crucible Assay and Assay Slags,' and 'Cupellation' are especially good. It is an excellent manual for students and a useful book of reference for assayers. The book is well illustrated. For sale by the MINING AND SCIENTIFIC PRESS at \$2.

'Electro-Analysis,' by Edgar F. Smith, Professor of Chemistry, University of Pennsylvania. Fourth Edition, 1907. Published by P. Blakiston's Son & Co. 336 pp. Price \$2.50. The rapid advance in the technical applications of electro-chemistry has caused the publication of a fourth edition of this book. Not only the older time-honored methods of electro-analysis are given in detail but also the latest methods, which laboratory research has proved to be accurate. Especial attention has been paid to describing the rapid methods of analysis depending upon the use of a mercury cathode and rotating anode. The length of time consumed in each precipitation is given, which greatly increases the usefulness of the book. It also contains a section upon the determination of cations and anions. For sale by the MINING AND SCIENTIFIC PRESS.

Publications Received.

From Cornell University, Ithaca, New York, we have received 'The President's Report' for 1906-1907.

The Illinois Bureau of Labor Statistics has sent us its 'Twenty-fifth Annual Coal Report,' giving the statistics of the coal industry of that State for 1906.

We are in receipt of the following advance chapters from the 'Mineral Resources of the United States for 1906:' 'The Production of Graphite,' by George Otis Smith; 'The Production of Coal,' by Edward W. Parker.

U. S. GEOLOGICAL SURVEY.—Advance chapter of the 'Mineral Resources of the United States' for the Year 1906: 'The Production of Lime and Sandlime Brick' by Edwin C. Eckel. Also Bulletin No. 309, 'The Santa Clara Valley, Puente Hills, and Los Angeles Oil Districts, Southern California,' by George Homans Eldredge and Ralph Arnold, 266 pages.

We have received the following advance chapters of the 'Mineral Resources of the United States' for 1906: 'The Production of Platinum,' by David T. Day; 'The Production of Mineral Paints,' by Edwin C. Eckel; 'Summary of the Mineral Production of the United States,' by Wm. Taylor Thorn; 'The Manufacture of Coke,' by Edward K. Parker; 'The Production of Antimony, Arsenic, Bismuth, and Selenium,' by Frank L. Hess; 'Statistics of the Clay-Working Industries in the United States,' by Jefferson Middleton; 'The Production of Manganese Ores,' by Edwin C. Eckel.

Commercial Paragraphs.

WM. P. BARBA, superintendent of the steel foundry of the MIDVALE STEEL CO., at Philadelphia, accompanied by JAS. C. H. FERGUSON, their Pacific Coast representative, are making an extended tour in the West to visit the smelters of Montana, Utah, Arizona, and Mexico.

J. H. ELSPASS, president of the Elspass Engineering Co., Denver, recently closed a contract with the U. S. Government for an Elspass mill, Pierce amalgamator, and other machinery for use in the mint at San Francisco. This is the second plant of the kind this company has sold to the Government for use in a mint, the other one being at Denver.

THE DENVER ENGINEERING WORKS CO. does not keep completed gears in stock, as we stated recently, but instead carries a large line of patterns for both machine cut and cast gears; this enables them to furnish gears on short notice. The rigid rolls, made by them, are so constructed that, when a large piece of iron or steel, such as a hammer-head or broken drill, gets into the rolls, a simple shearing-pin, consisting of an ordinary bolt, will break, thus preventing injury to the roll faces.

THE WELLMAN-SEEVER-MORGAN CO. has just opened a branch of its Pacific Coast office at 215 N. Centre St., Reno, Nevada, with L. F. White and L. L. Edwards as local representatives. W. Q. Wright, the Pacific Coast manager for the company, recently made an extensive automobile trip, visiting all the important Nevada camps, and has not seen fit to make any change in his original plans on account of the present depression. The Wellman-Seaver-Morgan Co. manufactures a complete line of mining and power machinery. Their engineering department is prepared to design complete equipments for mines and metallurgical plants. The Reno office will make a special study of Nevada conditions and will be in a position to give their clients the benefit of a large and experienced organization. Associated with the Nevada office, a construction company has been organized for the purpose of taking contracts for the installation of mining and reduction machinery, and for the construction of complete plants, turning these over in running order and taking all risks connected with the construction.

Catalogues Received.

THE C. O. BARTLETT & SNOW CO. of Cleveland, Ohio, have issued 'General Catalogue No. 18' for 1908.

THE CYCLONE DRILL CO., of Orrville, Ohio, has issued an attractive little booklet illustrating their drilling outfits.

THE JOHN A. TRAYLOR MACHINERY CO., of Denver, Colo., has issued bulletin 'H,' describing their line of crushing machinery.

THE WESTERN ELECTRIC CO. of San Francisco has issued a beautifully illustrated catalogue entitled 'Poles,' describing the way of handling timber used in the poles, piling, and railroad ties, sold by that company.

THE A. LIETZ CO. of San Francisco, have issued 'Publication C,' illustrating drawing instruments and office supplies such as are used by architects and engineers. 'Publication A,' illustrating the surveying instruments manufactured by that company, will soon be ready for distribution.

THE WESTERN METALLURGICAL CO. of Denver has issued a booklet entitled 'Mineralogist's Pocket Reference,' in which is given useful mineral tables and condensed information about the principal ores. It also gives prices charged by this company for analyzing and testing different substances.

THE THOMPSON BALANCE CO. of Denver has recently issued a 32-page catalogue entitled 'Precision Balances and Weights.' The catalogue describes the different styles of balances manufactured by this company, and especially their multiple rider attachment. In this attachment riders take the place of all flat weights for weighing up to 72 mg. on button-balances and up to 720 mg. on analytical balances.

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TABLE OF CONTENTS

Editorial:	Page.
Notes.....	723
Conditions at Goldfield.....	724
The Late Unpleasantness.....	725
By the Way.....	726
General Mining News.....	728
Special Correspondence.....	733
London.....	
Mexico.....	
Butte, Montana.....	
Concentrates.....	738
Discussion:	
Professional Customs.....	
.....C. S. Herzig, F. L. Sizer, Frank H. Probert	739
Cyanidation of Ore Containing Both Coarse and	
Fine Gold.....C. W. Van Law, Edward H. Nutter	742
Assessment Work.....H. G. Hills	742
Articles:	
Slime Treatment at Kalgoorlie.....	
.....M. W. Von Bernewitz	743
Tin Deposits of Cape Prince of Wales, Alaska.....	
.....Albert Hill Fay	744
Faulting in the Red Cloud Mine.....H. W. Turner	747
Road Distances in Nevada.....	748
Construction and Manipulation of a Gasoline	
Assay-Furnace.....Wilton E. Darrow	749
The Roasting of Telluride Ores.....	
.....T. T. Read, R. L. Muck, G. H. Seibird	751
Lifting Magnets.....	755
Mining and Metallurgical Patents.....	756
The Prospector.....	750
Decisions Relating to Mining.....	754
Departments:	
Personal.....	727
Obituary.....	727
Market Reports.....	727

Editorial.

FAULTING of veins presents many problems of practical moment to the miner. Therefore, careful descriptions of such occurrences are always welcome. In this issue Mr. H. W. Turner, a geologist and mining engineer well versed in such matters, gives a valuable article on the conditions observed in the Red Cloud mine.

FURTHER LETTERS discussing professional customs appear in this issue. We have a few more and they will appear shortly. Then we hope to summarize the discussion, which has proved interesting and, we hope, useful. In the meanwhile someone may wish to ask some really difficult questions in regard to professional ethics. They will be welcome.

EXPORTS OF COPPER during November were the highest on record, namely, 33,787 tons, as compared to 18,451 in the corresponding month of last year, and 13,195 tons two years ago. During the first eleven months of 1907 the exports totaled 189,167 tons, as compared to 190,615 tons during the same period last year. The sudden increase in the export of the metal explains the recent recovery in price, which was not maintained.

NEVADA has no State Militia, hence the Governor had no citizen troops at his disposal and called upon the Federal authorities for the protection deemed necessary at Goldfield. This obviated an intermediate condition of pseudo-military rule, usually prejudicial to the solution of industrial disturbances. Citizen soldiers do excellent work against a foreign foe, but as a weapon for quelling domestic disturbances they are unsatisfactory, simply because the military instinct is subordinated to political and economic prejudices.

IT IS INTERESTING to note that an intelligent foreigner landing at New York, and examining the new \$10 gold-piece, remarked that the pantaleted eagle closely resembled that upon an old Roman coin, and, on noting the absence of the motto, "In God we trust", this same foreigner voiced his regret that the four words which had expressed Lincoln's unshaken faith in the future of America should have been dropped. If we are to come to a purely agnostic basis, then the Thanksgiving proclamations are mere solecisms and we might as well be frank about it, inscribing upon our coins the battle-cry of a blatant materialism: "In Gold we trust."

SOME NEW FEATURES of feline finance are being illustrated in the case of the Llanos de Oro company, which was organized to exploit "plains of gold" in Sonora, Mexico. One of the interesting facts is that \$445,000 was plumped into a mining venture without engineering advice and the money was then expended

under the direction of an architect. Litigation is now pending between the promoters and it is likely that further illumination of the by-ways of speculation will be forthcoming. The pity of it is that such exposures come at the end of a boom, when wild-cats run to cover, and not at the beginning of a period of excitement, when a few object lessons might deter the simple from throwing away their money.

EXPERIMENTS are being made in a systematic way at the University of California to determine the flow of sand in rivers. These experiments are being conducted by the United States Geological Survey under the supervision of that veteran geologist, Mr. G. K. Gilbert. This is a part of the efforts made to solve that interminable tangle called the debris problem. It is hoped to find out how to maintain navigable conditions in the larger rivers receiving the drainage of the Sierra Nevada, not to mention the tailing from the gravel mines, of which class of material but little now finds itself into the rivers—for a good reason, most of the mines having been stopped by litigation and blackmail.

Conditions at Goldfield.

IN NOVEMBER the mine operators at Goldfield, by reason of the impossibility of obtaining currency, announced that they would pay wages in scrip. Thereupon the local miners' union, which is affiliated with the Western Federation of Miners, declared a strike. On December 2 the association of operators announced an abrogation of all agreements existing with the miners' union. Two days later the President issued orders for Federal troops to be in readiness to go to Goldfield, this action at Washington being due to representations telegraphed by the Governor of Nevada, in which he informed the President that the local authorities were unable to protect the community from disorder. On December 5 the general in command in California sent 435 men, in two detachments, to Goldfield and they reached that town on the 8th. Then the operators announced a decrease in wages, miners to be paid \$4, in place of \$5, per day and ordinary laborers \$3.75, instead of \$5, the rate hitherto prevailing. At the same time it was stated that an effort would be made to reduce the abnormal cost of living in the district and if the local merchants did not reduce prices, the operators would establish stores to remedy the excessive cost of food and supplies. On December 9 notice was given that three days later the operators would try to resume mining operations, employing all such men as accepted the new scale of wages, provided they were no longer members of the Western Federation. It is understood that a number of men are to be imported from California to take the place of those refusing to return to work under the conditions imposed by the operators. On December 11 the President ordered three representatives of the Department of Commerce and Labor to proceed from Washington to Goldfield, to ascertain the real conditions prevailing in Nevada, with a view to a trustworthy report. To complete this record of events it should be

added that on December 9 the Western Federation officially terminated or "called off" the strike in the Cripple Creek district. This strike, which led to numerous outrages both by miners and operators, was declared in August, 1903.

Beyond the facts narrated in the preceding paragraph it must be stated that the present crisis at Goldfield is the inevitable climax of conditions that have disgraced Nevada and the United States for two or three years. The agitators responsible for the troubles in Colorado and Idaho have congregated to the new bonanza camps of Nevada and they have established a terrorism concerning which comparatively little has been printed, mainly because the mine operators deprecated the publication of information likely to affect the speculation in stocks. At least a score of men have been killed or have disappeared in a suggestive way during the past two years, many more have been assaulted, beaten, and driven out of the district by ruffians claiming to act in the interest of the miners' union, and a number of mining engineers and operators from Colorado and Idaho have been warned not to come to Goldfield. Most of them have heeded the warning, otherwise additional brutalities might have occurred. This industrial devil's kettle has been simmering for a long time and if it did not boil over before the eyes of the world, it was because the greed of men caused them to endure tyranny rather than induce an exposure that would have killed the gambling in mining stocks. Now that the monetary flurry has put a temporary end to flamboyant finance and the stock market looks less important than the real work of mining, the operators have forced the situation and unmasked the anarchy that has prevailed so long. The lessees, who have operated most of the rich mines until lately, paid preposterous wages, as compared to other districts, because they were in a hurry to extract ore of unusual richness; the miners knew that the operators' anxiety to avoid a cessation of work gave them the whip hand and so they made excessive demands, until Goldfield upset the whole labor market of the West. It was an unstable state of affairs and was bound to come to an end. That end is now in sight.

The sending of Federal troops is much to be commended. They are there, as the President says, "neither for nor against the strikers or the employers. They are to prevent riot, violence, and disorder, under and in accordance with the Constitution and the laws of the land. No man is to be interfered with as long as he conducts himself in a peaceful and orderly manner." In face of the failure of the local authorities and of the State to enforce the law and to ensure each man protection while at work, there was nothing else to do and we deem it fortunate that the troops were sent so promptly. The Federal investigation of the local industrial conditions is also likely to be useful. Publicity will help to curb the actions of both sides and it is right that the country should be informed of the real facts of the case, so that public opinion may be rendered intelligent and effective. The newspapers, unfortunately, take sides in these industrial quarrels, so that the

average man rarely gets anything but a distorted story. Let there be a fair field and no favor. If a man does not care to work for \$4 per day, he has the right to refuse; if another man is willing to take \$4 per day, he ought to be able to go to work unmolested, even if it takes the whole United States Army to protect him from violence. On the other hand, the operators have no right to ask a man to what union, club, or political party he may belong, and while in this case the Western Federation is justly treated as an outlaw, we regret that the operators should discriminate against men by reason of their affiliations. We hope the quarrel will be fought to a conclusion without any of the violence and brutality that marked events in Colorado and Idaho. The country is deeply interested in seeing that this purely industrial dispute is settled lawfully. The success of either disputant is wholly secondary to the maintenance of representative government.

The Late Unpleasantness.

IT IS SAID that the panic of 1873 most nearly compares with that of 1907. The Civil War in America, the wars of Italy and Prussia against Austria in 1866, and the Franco-German war of 1870, had destroyed a vast amount of capital. The United States had escaped the forced liquidation following upon the collapse of credit in Europe and had absorbed an enormous amount of capital in the reproductive enterprises started after the Civil War. Railroads had been built at a tremendous rate, joint-stock companies and mining schemes had permitted of reckless inflation, so that by 1873 everything was ready for the explosion started by the failure of Jay Cook & Company. On the other hand, in 1898 we had the Spanish-American embroglio, in 1899 and the succeeding three years the Boer war, in 1904 the tremendous struggle between Japan and Russia; then came the destructive earthquakes of San Francisco, Valparaiso, and Kingston, each accompanied by direct and indirect destruction of capital, reaching in the case of the San Francisco seismic conflagration to no less a sum than \$500,000,000. Despite the waste of productive energy and the obliteration of capital that occurred in rapid succession during the eight years, from 1898 to 1906, the United States enjoyed an almost uninterrupted industrial development and a business boom of magnificent proportions. The reaction was bound to come; it came; it is passing.

At least \$25,000,000 of emergency currency was in use a couple of weeks ago in the various cities of the country outside of New York. These makeshifts are really prohibited by law, for the National Bank Act recites that "no national banking association shall issue any other notes to circulate as money than such as are authorized by the provisions of this title." It would be well to amend the law in this matter in accord with public usage, for infractions of law, even if generally approved by public opinion, are detrimental to good government. It is estimated that the total amount of emergency currency issued in 1907 was at least four times that in circu-

lation during the panic of 1893. However, a statement was made in Congress that not a dollar was lost by anyone accepting such notes in 1893, even when they were tokens printed and circulated by merchants. They were retired immediately upon the resumption of cash payments by the banks, and it is likely that those of 1907 will enjoy an equally brief but useful career. Hoarding by anti-social individuals has been succeeded by hoarding on the part of nervous bankers. At New York the panic was short-lived; it has been followed by extreme efforts at self-preservation by interior banks that have heaped up reserves to meet an expected crisis. Then London became scared and our own Government made an issue of bonds that proved unnecessary. These fits of feverish anxiety are over and the good sense of the people of the country has restored confidence. Never was there a severer test of the self-reliant quality that has meant so much to American progress. At times boastful and reckless, too self-assertive, it may be, and regardless of precedent, nevertheless, the recent episode does honor to the stability of American institutions and the essential sanity of our people.

The amount of gold imported to relieve the stringency was just about equal to the annual yield of American mines—a little under \$100,000,000. Nevertheless, the withdrawal of it from Europe was likened to a raid and it caused money rates to soar. In the modern world the ratio of business done to the money changing hands increases with the growth of credit, so that nowadays only about 5% of business is done on a currency basis. The pyramid is upside down and as the actual base becomes smaller, a slight shifting produces far reaching disturbances. Such disturbances overwhelm enterprises leaning heavily on credit and disorganize business, but they become less injurious as civilization progresses and the machinery of commerce is developed. Twenty years ago such a collapse in the stock market as was seen at New York at the end of October would have been followed promptly by the announcement of many failures among brokers and jobbers, and scores of speculators would have been declared bankrupt. But nowadays there is every effort made to assist those in distress and to patch up financial holes, not entirely from altruistic motives, but because financiers realize that it is to their interest to prevent disorganization from spreading too far, until it undermines even perfectly solvent enterprises.

Various prognostications have been made as regards the course of business in the near future. The balance of probabilities indicates that the worst effects of the shock to credit will soon be over and that a slow recovery will supervene; in the spring there will be a marked revival and it will be checked only by the Presidential election. Should the result be obvious and satisfactory, it will be discounted and further expansion of business will follow. In any case, at the end of twelve months the tide of prosperity will be again in full motion. This may seem optimistic, but it is an optimism based on an appreciation of the resilient strength of a continental country in process of rapid and profitable industrial development.

By the Way.

At a recent meeting of the American Institute of Mining Engineers, Mr. James Douglas spoke concerning 'Secrecy in the Arts.' He said:

If it is the fact that technical science has progressed of late with such unwonted speed through the co-operation of many workers, and that this co-operation has been made possible by the publication and exchange of ideas and experiences in the technical and scientific journals, would not our progress be even more rapid and thorough if all barriers of secrecy were broken down, and every encouragement were given to our technical workers to describe, in print and by conference, their notions and their actual experiments? This is the attitude of some, I may almost say of most, of our large concerns, but unfortunately it is not that of all. It is impossible to compare, as to efficiency and profit, works, the gates of which are fast shut, and in which obscurity and secrecy are imposed and practised, with those to which free admission is granted and in which freedom of information is encouraged. But the following reflections force themselves upon us in this connection. We know that very few technical papers issue from certain establishments; that on their officials silence is imposed; and that to these works inquisitive visitors are politely but peremptorily refused admission. There are not many such, but they are and have been very successful. But suppose that in imitation of their practice and regulations all were tempted to adopt it, so that the same policy became universal; what a sudden paralysis of industry would follow! Our secretaries would find it difficult to fill even their shrunken volumes of transactions with papers worth printing; our students would have to content themselves with the antiquated learning which their professors could supply; for there would be no more summer classes for practical work in mines, smelters, and electrical factories, and the professors themselves would have to learn from old books. Every manufacturer and smelter would be obliged to bribe his neighbor's workmen and tempt away his neighbor's superintendents for information. As a result, before long, the very works which now find it so profitable, or think they do, to tap their friend's stock of knowledge and experience, and give nothing in return, would be driven in upon their own resources, and would undoubtedly then find them not so complete as they imagine. Of course, I am supposing an impossibility, because the spirit of intellectual freedom in our professions is too strong and too widespread to submit to such a tyranny, and because, before such darkness of ignorance had settled down to our great industries, the most pronounced advocates of secrecy would feel and acknowledge the ultimate consequences of concealment, and would become reformers. Today they may have secrets, as valuable as Sir Henry's method of making plate glass and bronze powder, which it may pay them to conceal from their competitors, so long as they are admitted freely to their competitor's open shops; but even this is doubtful. For the spirit of secrecy is intimately allied with the spirit of suspicion and distrust; and the mind which is always suspecting is closed tight against the admission of fresh and fair impressions. Being jealous of others, it is prejudiced against their suggestions, and correspondingly prejudiced in favor of its own preconceptions. Progress therefore ceases.

This is a temper of mind foreign to a new country like ours, whose special industries have not been established long enough to wear grooves of rigid practice and sink into ruts of self-satisfied indifference. About the best correction we can apply to the growth of dry-rot is the banishment of secrecy. A curious instance of its blight-

ing influence is seen in some of the older, not the newer, industries of the old world. The iron and steel works of Europe have not kept pace with ours in size and production, but the iron-masters of Great Britain and Germany, in coke-making and in blast-furnace economies and in steel-making processes, have been our teachers. Nor have they been shy of communicating their improvements, or, through jealousy of our success, slow in adopting ours. No nobler monument of international comity in thought and experience exists than the seventy volumes of the *Proceedings of the Iron and Steel Institute*. And with few exceptions the iron and steel works of England, Scotland, Germany, and France are open to any accredited worker in the same domain. Yet before England was conspicuous as a maker of iron, she was famous the world over for her copper and tin production. But, between self-conceit and the inbred habits of trade-secrecy, her copper-smelting industry has fallen from its high estate. And it is not accidental, but linked as closely as any effect with its cause, that this decline is in great part the result of habits of secrecy which grew with the growth of age. At Swansea, every gate to the smelting works is guarded, and as a result it has been as difficult for thought to escape out as for suggestions to find their way in. Swansea should still enjoy the leadership which her skilled labor, splendid coal, and commanding maritime situation put within her reach; but she has preferred to gloat over her secrets behind closed doors rather than go out into the world in search of new business as well as technical methods, while also inviting the world to enter and exchange ideas with her. What is the consequence? New Zealand copper comes here to be refined, notwithstanding the first practical application of electrolysis to metals was made by Elkinton in England, and the Vivians adopted the Manhes method before Farrel introduced it into this country.

There are, however, of course, exceptions in England to this too prevalent habit of secrecy. To the works of the Rio Tinto at Port Talbot or of the Cape Copper Co. at Briton Ferry in South Wales, where metallurgical novelties have been tried, introductions are not refused. But the alliance of decay and suspicion in the instance I have given can hardly be accidental; and we may be sure that what is baneful in its effects in Europe is not likely to be beneficial here; for while the Atlantic separates continents it does not delimit the operation of laws.

In political life, vitality is maintained only when every man takes his full share as a debater in the discussion of political questions, and as a voter in the determination of state affairs. So in scientific and technical matters, the banishment of deceit, mystery, and jealousy, and the freest admission of daylight by means of the unreserved diffusion of information through the press and personal intercourse, will instill into the whole body of workers a feeling of healthy rivalry, which, while stimulating their mental activity, will correspondingly benefit the financial interests of their employers.

I have supposed an extreme case—that the example set by our few secretive establishments were followed by all. Let me imagine a more probable issue, such as, I believe, will result from the fellowship of knowledge and experience which our national engineering societies have in view—namely, that all our technical manufacturers will learn how they gain, and not lose, by encouraging their staff officers to study their neighbors' methods, and by throwing open their own establishments, in turn, to the freest criticisms of their competitors in trade. What will result? Nothing but advantage, I believe, to all whose wisdom and means have enabled them to provide themselves with the raw material of manufacture on advantageous terms, and to locate their works or factories at localities favorable for economical operation.

Personal.

BERNARD MACDONALD is again at Guanajuato.

ALFRED JAMES returned to England on the *Celtic*.

VICTOR G. HILLS of Denver is examining mines in Arizona.

NORMAN ROWE has been appointed Consul at Guanajuato.

J. M. NICOL has returned to San Francisco from Nicaragua.

R. A. F. PENROSE has returned to Philadelphia from Brazil.

EDWARD D. McDERMOTT was married on November 28 at London.

F. M. SIMPSON is metallurgist at the Vivian mine, in Arizona.

F. L. BENSUSAN is engineer at the Dolores mine, in Chihuahua, Mexico.

W. H. STAYER is resident manager of the Zaruma gold mines in Ecuador.

JULES LABARTHE is manager of the Trail smelter, in British Columbia.

JOHN A. CHURCH passed through San Francisco on his return from Japan.

FRED. N. ROGERS, formerly in Gilpin county, Colorado, is in San Francisco.

ARNOLD BECKER is now engaged in geological investigations at Goldfield.

C. E. RHODES, formerly at the Dos Estrellas mine, El Oro, is now at Guanajuato.

LOUIS KATONA, a Hungarian mining engineer, sailed on the *Alameda* for Melbourne.

CHARLES H. HUMPHREYS is metallurgist at the Mt. Morgan mine, in Queensland.

JESSE J. MACDONALD is now at Denver, with an office in the Commonwealth Building.

P. E. O. CARR has been appointed general manager for the Mazapil Copper Co., in Zacateces, Mexico.

JOHN HAYS HAMMOND was in San Francisco, on his way to the gold dredging operations on the Yuba.

C. W. P. WHITE is superintendent of mines at St. Eugene, B. C., for the Consolidated Company.

EDWARD THORNTON is superintendent of the Dolores mine, near Matchuala, in San Louis Potosi, Mexico.

WILLIAM THOMPSON, manager for the Waterson Gold Mining Co., at Ocampo, Mexico, has gone to London.

NATHAN P. MANSFIELD, at one time superintendent of the Smuggler-Union mine, near Telluride, is now living at Berkeley.

THE ENGINEERS SOCIETY OF SOUTH WESTERN MISSOURI is a flourishing organization at Joplin, Mo. It has about 50 members and the following are its present officers: NAT PAIGE, president; A. E. BENDELARI, vice-president; C. S. BANKARD, secretary. Club rooms have been fitted up in the Olvya Apartment Bldg., and visiting engineers and mining men are welcome there. During the Mining Congress held in Joplin this society entertained the visitors at a smoker.

Obituary.

W. R. BOGGS JR. was killed near Topia, in Mexico, on December 1. Owing to the failure of his company to pay the wages due to the employees, a mob of miners met him on the road and stoned him to death. He was born in 1857 and graduated from the Virginia Polytechnic Institute in 1877, taking a supplementary course at Columbia. His professional work took him to Leadville and Rico, in Colorado, and to many parts of Mexico. He was an engineer of reputation and the writer of several papers on mining geology. A number of men implicated in the horrible fatality have been arrested.

Latest Market Reports.

LOCAL METAL PRICES—Dec. 12.

Antimony.....	13@17c	Quicksilver (flask).....	\$45.50
Castling Copper.....	18@19c	Spelter.....	7@ 7.75c
Pig Lead.....	4.25@ 5.20c	Tin.....	35@36½c

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.

Date	Electrolytic Copper	Lead	Spelter	Silver
Dec. 6.....	13¼	3.95	4.43	57½
" 7.....	13¼	3.95	4.38	56½
" 8.....	Sunday. No market.			
" 9.....	13½	3.95	4.33	55½
" 10.....	13½	3.90	4.33	55½
" 11.....	13	3.90	4.33	56¼
" 12.....	13	3.85	4.33	55½

ANGLO-AMERICAN SHARES.

Cabled from London.

	Dec. 5.	Dec. 12.
	£. s. d.	£. s. d.
Jamp Bld.....	0 14 0	0 14 0
El Oro.....	1 2 0	1 1 3
Esperanza.....	1 9 6	1 10 0
Dolores.....	1 0 0	1 0 0
Oroville Dredging.....	0 14 3	0 14 0
Stratton's Independence.....	0 2 9	0 3 6
Pomboy.....	1 10 6	1 10 0

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

MINING STOCK QUOTATIONS—NEW YORK.

Closing Prices.

	Dec. 4.	Dec. 11.
Bingham Central.....	½	½
Boston Copper.....	10½	10
Cumberland Ely.....	5¼	5½
Dolores.....	5¼	5¼
El Rayo.....	19¼	19½
Guanajuato Con.....	2½	2¼
Giroux Con.....	3	2¼
Nevada Con.....	7½	7½
Nipissing.....	6	6¾
Tennessee Copper.....	26½	28
Tonopah Ex.....	.....	17½
Tonopah-Belmont.....	.....	1½
Tonopah.....	6¼	6½
United Copper.....	7½	7½
Utah Copper.....	17½	15¼

(By courtesy of Hayden, Stone & Co., 25 Broad St., New York.)

SOUTHERN NEVADA STOCKS.

San Francisco, Dec. 12.

Atlanta.....	\$ 25	Laguna.....	75
Belmont.....	1.00	Manhattan Con.....	25
Columbia Mtn.....	17	Midway.....	48
Combination Fraction.....	71	Mizpah Extension.....	20
Daisy.....	81	Mohawk.....	10.00
Fairview Eagle.....	60	Montana Tonopah.....	1.85
Florence.....	3.70	Nevada Hills.....	3.00
Gold Bar (Bullfrog).....	45	Red Top.....	.....
Goldfield Con.....	3.97½	Sandstorm.....	21
Goldfield of Nevada.....	.....	Silver Pick.....	24
Gold Kewanas.....	25	St. Ives.....	43
Great Bend.....	26	Tonopah Extension.....	1.75
Jim Butler.....	47	Tonopah of Nevada.....	6.50
Jumbo.....	.....	Tramp Con.....	21
Jumbo Extension.....	65	West End.....	30

(By courtesy of W. C. Ralston, 368 Bush St.)

COPPER SHARES—BOSTON.

	Closing prices. Dec. 12.		Closing prices. Dec. 12.
Adventure.....	2½	Michigan.....	8½
Ahmeek.....	50	Mohawk.....	46
Allouez.....	21½	Nevada Con.....	7¼
Amalgamated.....	45¼	North Butte.....	37¼
Areadian.....	3½	Old Dominion.....	25
Atlantic.....	9	Osceola.....	82
Balaklala.....	2½	Parrot.....	9
Bingham Con.....	.....	Phoenix.....	75
Boston Con.....	95½	Quincy.....	78
Butte Coalition.....	13½	Raven.....	90
Calumet & Arizona.....	94	Rhode Island.....	2½
Calumet & Hecla.....	600	Santa Fe.....	14¼
Centennial.....	24	Shannon.....	9¼
Con. Mercur.....	25	Superior & Pittsburg.....	89½
Copper Range.....	53	Tamarack.....	60
Daly-West.....	8¼	Trinity.....	13½
Franklin.....	7½	United Copper com.....	7¼
Granby.....	75	Utah Copper.....	15¼
Greene-Canaan, clf.....	5½	Victoria.....	4½
Isle Royale.....	16	Winona.....	4
Mass.....	2½	Wolverine.....	110

General Mining News.

ALASKA.

There is quite a rush to the new gold district on Valdez creek, a tributary of Shushitna river; this camp is 200 miles from Valdez. About 300 men have left Fairbanks and about 100 have started from Valdez. This is the first important discovery in the Shushitna valley. This winter the main line of travel will be by the Valdez-Fairbanks trail rather than via Seward. Pete Monahan is stated to be the discoverer of the new district.—It is reported that much volcanic ash has fallen in the vicinity of Nome. This will interfere with early winter travel.—Gold dust and gold bricks valued at \$1,200,000 are being sent out over the snow from Fairbanks.—It is reported that Cleary city, near Fairbanks, was burned about the middle of November. The loss is about \$250,000.—The Alaska Treadwell Co., on Douglas island, is building 33 new houses for its employees. It is reported that the company can give employment to 300 more men than it has at present. The company is desirous of getting men with families.—Copper has been discovered on Nabesna creek, near the head of Copper river. A vein, 8 ft. wide, carrying chalcopryite and bornite, has been found.

KLONDIKE, CANADA.

It is reported that there is some good placer ground on Pelly river.—A. J. Beaudette, Government mining engineer, is collecting specimens of placer tin for the Canadian Geological Survey. Some placer tin occurs in the placer gravel of the Yukon river. It is claimed that tin-bearing veins have been found near the mouth of Bonanza creek and also on Boucher creek, a tributary of Sixty-Mile.—Considerable placer prospecting is being done on new creeks, flowing into the Yukon below Gibbon. At Gold Hill, about 25 miles below Gibbon, much work is being done. The town consists of 7 buildings and 150 tents. The gravel is said to prospect 45c. per pan. On Sellinger creek, also below Gibbon, 35 men are working. On Melozzi river, which flows into the Yukon about half-way between Tanana and Innoko rivers, considerable prospecting is being done. Some placer ground and some quartz veins have been discovered. It is rumored that rich gravel has been discovered on the Yukon just opposite the mouth of Melozzi river.

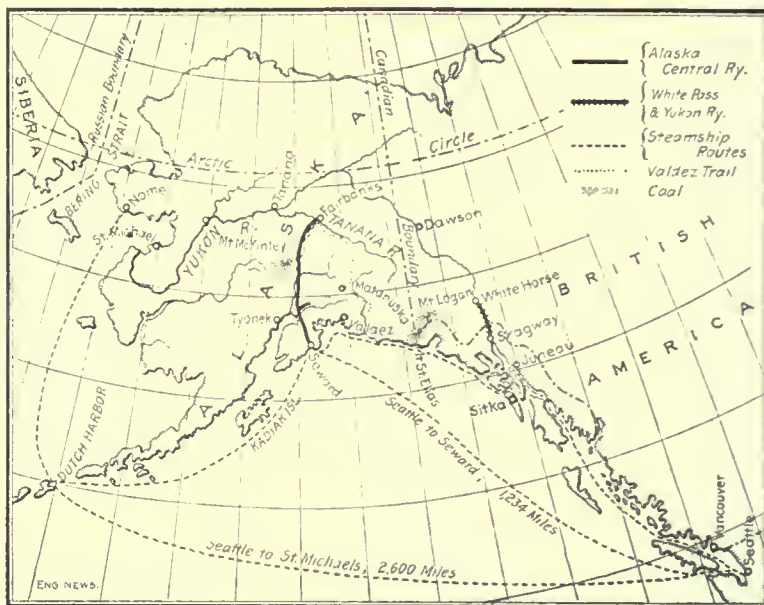
W. J. Elmendorf states that at the property of the Arctic Cliff Copper M. Co., in the White Horse district, considerable development was done last summer, and large bodies of copper were discovered. In the Arctic Cliff claims alone there are now blocked out 100,000 tons of ore. This carries from 5 to 6% copper, and from \$4 to \$5 in silver and gold per ton. The entire ore deposits of the district are of the same quality. Much development work has also been done by other companies operating in that district. Most of the development done by the Arctic Cliff company has been on the Best Chance, near White Horse. The White Pass & Yukon railway is now building a spur 12 miles in length to penetrate this district. This will also open up the Pueblo mine, which Byron N. White of Spokane has been developing for the last two years. The railway is expected to reach the mines by next July, and then shipping will begin. By that time there will be 300 tons of ore daily for shipment. This will be treated at the various smelters on the Pacific Coast. The Arctic Cliff company expects to ship about 100 tons per day.

ARIZONA.

COCHISE COUNTY.

The Copper Belle M. Co., of Gleeson, has been made defendant in a suit for \$265,416 just filed by Paine, Webber & Co., of Boston. The mine belonging to the company has produced nearly \$1,000,000 in copper. Recently the Shan-

non Copper Co. took a bond on the property for a large sum. Martin Costello also holds a mortgage for \$80,000 on the property.—The miners and shovelers at the Butte & Arizona mine refused to accept the reduction of the wages to the scale prevailing in Butte and Bisbee. Only 12 men quit, as the machinists and surface-men accepted the reduction. While labor was scarce the company paid 25 cents above the Bisbee scale. Miners have been obtained in Bisbee to take the places of those that quit. The mine is looking well and work will be continued in spite of the financial depression.—The recent strike of good copper ore in the Emerald mine, at Tombstone, continues to look well as development progresses.—The Copper Queen Co. is sinking a new shaft, called the Uncle Sam, within a short distance of the old Uncle Sam shaft and about 600 ft. west of the Shattuck-Arizona; this shaft is now 50 ft. deep. It is being sunk to develop orebodies thought to exist in that vicinity; this ground is too far from the Cuprite to be conveniently developed from that shaft. An engine and head-frame has been placed at this shaft. The three drifts which are being driven from the other properties to the Sacramento shaft are progressing rapidly. The Sacramento shaft is now over 1,100



Map of Alaska.

ft. deep and will be continued to 1,200.—The directors of the Calumet & Arizona Co. have declared a dividend of \$1.50 per share; this amounts to \$300,000 and brings the total dividends disbursed to \$9,300,000, all in five years.—At the Superior & Pittsburg shafts development work is progressing with favorable results; a new orebody has been found in L. S. & P. ground. The water pumped at the Briggs shaft is rapidly decreasing in amount; formerly 3,000 gal. per minute were raised, but now only 700 gal. This is due to the fact that the cross-cut from the Junction shaft is draining much of the ground formerly drained by the Briggs shaft. Shipments to the C. & A. smelter, at Douglas, are being made from the Hoatson, Junction, and Cole shafts.—At the Shattuck-Arizona 30 men are working; they are developing new ground on the 700 and 800-ft. levels. The damage to the shaft and the pump-station on the 800-ft. level has been repaired.—At the Denn-Arizona 10 men are working. Diamond-drilling on the 1,100-ft. level has been resumed.—The gases from the fire which hampered mining at the Irish Mag, Gardiner, and Spray shafts has been entirely controlled by the bulkheads erected.—Much repairing and overhauling is being done at the Copper Queen and C. & A. smelters at Douglas.

GILA COUNTY.

The cross-cut on the sixteenth level of the Old Dominion mine has broken into sulphide vein No. 1. The ore resembles that on the fourteenth level from the same vein; next to the hanging wall it shows a low-grade concentrating ore. At the smelter four furnaces are now in operation.—The Superior & Boston M. Co. has re-elected the old board of

directors.—At the Mallory shaft of the Globe Consolidated Co. work was suspended for 10 days until an extension could be obtained for the final payment. Work has been resumed on the 860-ft. level.

GRAHAM COUNTY.

The Shannon Copper Co. and the Arizona Copper Co. have discharged all their mechanics, owing to the refusal to accept the reduction in wages.—At the property of the New York-Arizona Gold & Copper Co. the Lillian adit is 500 ft. long; it has developed considerable ore carrying gold, silver, and copper. The Williams adit is 200 ft. long; the vein in this adit is 12 ft. wide and carries considerable gold and silver. The Thompson adit is 210 ft. long. The rich ore found on the Buzzard Shadow claim still looks well.

One of the sessions of the Grand Lodge of Masons was held in one of the stopes of the Lone Star mine of the Detroit Copper Co. This stope is 100 ft. long, 35 ft. wide, and about 40 ft. high. The ore was leveled, and a plank floor was laid and covered with linoleum. The stope was lighted with electricity, and the walls were beautifully decorated.—The shaft at the property of the Bonita Copper Co., in Lone Star district, is now 80 ft. deep. This was started about three weeks ago. A steam hoist will be installed soon. About 25 men are working at the property.—The Arizona Amalgamated Co. has obtained an extension of the bond upon the properties which they are developing.—The Bacon & Langerman silver property has a large amount of ore ready for shipment; this was extracted in the course of development. Owing to the fact that the smelters at Douglas cannot receive much of this ore at present, only a few carloads will be shipped each month.

MARICOPA COUNTY.

Very few of the mines near Wickenburg have shut down completely but, owing to the slump in copper, many of the copper properties have followed the example of the large copper mines of the country and have laid off about half the miners. There is practically no change at the gold properties, as most of them are working their usual force of miners.—The main shaft at the Monte Cristo is now 180 ft. deep and is still in good silver ore. There is very little water in the shaft, although some of the old workings nearby are flooded. When a depth of 200 ft. is reached, cross-cutting will begin.—The machinery for the mill on the Monarch property has arrived and will be installed immediately; it is expected that this mill will be running by the first of the year.

MOHAVE COUNTY.

H. G. Heffron has been made superintendent of the Gold Road mine to succeed S. R. Porter, who resigned recently. The mine has been placed on a dividend-paying basis and considerable gold ore has been blocked out. There is much broken ore in the stopes. A dissention has arisen among the stockholders regarding the building of a modern mill. The American stockholders want to build a modern plant, while the French oppose this and wish to continue to treat the ore in the old mill. It is possible that the mine will close down on account of this disagreement.—At the Enterprise mine, 15 miles east of Kingman, a body of good copper ore has been discovered in the cross-cut from the east drift on the 120-ft. level.—The Tennessee mill at Chloride has been running regularly on the old mill tailing. A good zinc concentrate is being made by the jigs. The static machine does good work but another separator will have to be put in to treat the intermediate sizes from the crushers. As soon as this arrives the mill will be kept constantly on good ore.—Regular shipments of lead concentrate are being made from the Banner mines at Stockton hill.

At the Idaho mine near Cerbat mining has been resumed; the mill is now in readiness to treat the zinc ore from this mine. A carload of zinc is ready for shipment. John Boyle Jr. is superintendent.—At the property of the Victor Gold M. Co. near Vivian grading has begun for the new cyanide mill.

PINAL COUNTY.

At the property of the Alta M. Co. near Mineral hill the new air-compressor, hoist, and pumping machinery have been installed and sinking will be resumed in the Black Cop-

per shaft with machine-drills.—The Saddle Mountain M. Co., whose copper mine is near Christmas, has filed with the County Recorder a mortgage on their mine and smelter for \$1,000,000.—The shaft at the Oklahoma mine on Mineral hill is now 100 ft. deep. The new No. 9 Cameron sinking-pump is able to take care of the increased flow of water which has been cut in the shaft.—At the Cochran mine 25 men are working and much development work is being done.—The Imperial Copper Co. is employing between 350 and 400 men at its mines at Silverbell and its smelter at Sasco. It is expected that the smelter will be completed by Jan. 1; its capacity will be 350 tons. The concentrator will not be completed until quite a little later.

CALIFORNIA.

BUTTE COUNTY.

The recent strike made near Kimshew, in the claims owned by W. P. Lynch, J. F. Lynch, O. C. Barber and others has proved very rich. This property is situated on Snow's Table Mtn. This mountain is capped by lava flows, 250 to 300 ft. deep. A cross-cut adit was run to cut a supposed deep channel. This cut the channel and the gravel proved very rich, indicating that it was the source of the gold mined in early days in the ravines of Snow's Table Mtn. In the early sixties about 100 men were working on the gravel in these ravines; several hundreds of thousand dollars were produced.

NEVADA COUNTY.

Now that the air shaft at the California mine has been finished, the chute of ore found in this shaft will be developed. Good ore is being mined in the south drift of the lowest level. The Idaho-Maryland mill has been leased for the purpose of treating 200 tons of ore from this mine.—Development work has been resumed at the Banner mine; at present 16 men are working, but the force will soon be increased. The new shoot of ore found in the south drift of the 900-ft. level is 5½ ft. wide. Two shifts are now working at the Idaho-Maryland. The new shoot discovered on the 500-ft. level, and about 1,500 ft. east of the shaft, is looking quite well; the ore is quartz carrying sulphides and some free gold.—At present the Sultana company is greatly hampered by the lack of power, so it proposes to build a power plant of its own. The Prescott Hill shaft is now 1,140 ft. deep. This will be sunk to 1,500 ft., where a station will be cut and a large electric pump will be installed.—The new 10-stamp mill at the Ancho mine, near Graniteville, is now completed. A good boarding-house has also been built. During the winter the mill will be run on the ore that comes from development.—At the Delhi mine rich ore has been found in the shaft that has been sunk from the east drift of the lower adit level; this shaft is now 300 ft. deep. Most of the ore being treated in the 20-stamp mill is being stoped from this part of the mine. At present 35 men are working at the mine and mill; ten other men are repairing the Bloody Run ditch and flume, which furnishes part of the water used at the mill. The vein at this mine is from 2 to 5 ft. wide.—At the Champion mine a vein of ore 6 ft. wide has been found in the hanging wall south of the shaft on the 800-ft. level.—At the Marcotte mine the 5-stamp mill is being kept busy with ore from the adit.—Work has been resumed at the Banner mine, which has been shut down since Nov. 20. This mine is owned by Mrs. L. S. Huntington, of New York, and is being worked under a bond by E. C. Vorheis, Fred. W. Bradley, and others. Last month a vein 5½ ft. wide was found on the 900-ft. level; a drift 23 ft. long has been driven following this vein. This ore is said to average \$20 per ton. In 1865 to 1872 this mine was worked to a depth of 600 ft. and produced a large amount of ore. The vein was faulted on that level. After desultory attempts to find the vein the mine was abandoned.

(Special Correspondence).—Sinking at the Central shaft has been temporarily suspended owing to an injury to the hoisting engine. As soon as the damage is repaired sinking will be resumed.—It is reported that the Conlan mine will be re-opened at an early date. The general manager for the company is now in the East raising funds to work the mine, and is expected to return here soon with ample capital to proceed with development work.—The electric

plunger pump for the Prescott Hill shaft is nearing completion at the foundry of the Taylor Engineering Co. The pump will have a capacity of 500 gal. per min.—Considerable exploration work is under way at the Pennsylvania-W. Y. O. D. mine and several men are employed. Bennet Opie is superintendent.—The working force at the Kenosha was recently increased, and some rich ore is being developed.—At the Brunswick excellent milling ore is being extracted and the mill is running on good ore. Considerable development work is under way.—Samples of ore, assaying from \$3.50 to \$15 in gold per ton, have been taken from shallow holes on the Buena Vista ranch.—Norman E. McGregor has struck some good ore on an extension of the Reese Ravine quartz mine, near Poker Flat. He has located several claims in that vicinity.—The Lulu, Gold Buck, and Nim's Choice claims have been located in the Meadow Lake section.—Men are pouring into the county from all sections, with the expectations of securing employment. The labor field here is overcrowded at present, and many of the men will have to seek work elsewhere.

Grass Valley, Dec. 9.

SHASTA COUNTY.

At the Mountain Copper Co.'s smelter at Keswick 10 men have been at work, since the smelter shut down, cleaning up matte and loading it for shipment. The work has been



Map of California.

finished and these have been laid off. There are about 50 men on the company's payroll. Work continues at the mine. The foundry is being run on work for the Martinez plant and on custom work for the Mammoth smelter at Kennett.—A majority of the stockholders of the Balaklala Consolidated Copper Co. have agreed to the plan for reorganization through a syndicate, which will make an assessment of \$2 per share; this will amount to \$1,050,000.—The Annie mine in the Stillwater district has been sold to Joseph Jaegel.

SIERRA COUNTY.

Work has been resumed at the West Point drift mine; the adit is being driven through the channel to cut the White Bear vein, supposed to be about 50 ft. beyond the face of the adit.—Surface work has been suspended at the Sovereign mine. An air-compressor is being installed; work will then be resumed in the lower adit.—At the Red Star mine, near Alleghany, several buildings are being erected. The electric light plant has been completed and the adit has been wired. Three shifts are working in this adit, which is being driven

to try to find a continuation of the rich vein found in the nearby Tightner mine. L. P. Woodbury is superintendent.—Several miners have been laid off at the Young America drift mine; a few others have quit of their own accord. The men are said to have received no pay for the last two months.—The adit at the South Fork mine is steadily advancing. F. W. Kuhfeld is superintendent.—A. L. Wilson and J. S. Frye have found good pay-gravel in their drift mine at Cold Springs. This channel is thought to be the same as the upper channel of the Bald Mountain Extension property.

TRINITY COUNTY.

Only 45 men are working at the Bonanza King mine and mill, near Trinity Center. The surface improvements have been completed, so all those men have been laid off.—The mill at the Golden Jubilee mine near Carrville has been finished.—The Nash mine has closed for the winter.

TUOLUMNE COUNTY.

At the Soulsby mine the change-house was burned last week. About 20 men are working at this mine.—The Republican mine near Jacksonville has been bonded to F. B. Keever and J. R. Bryson, who represent Boston people; work has been resumed at the mine.

YUBA COUNTY.

The Iron Mountain Copper mine near Fernley has closed down; 10 miners were employed at this mine.—Considerable development work is being done at the Blue Point mine, owned by M. Marshall and others.

COLORADO.

CLEAR CREEK COUNTY.

(Special Correspondence). The vein in the Sunburst mine has widened from 4 ft. to 6 ft., the drift is now 40 ft. long, and stoping will begin soon. The ore carries considerable silver glance and gray copper. At the East Argente the Corwin vein has been intersected in the Tobin adit. At the Muscovite mine the old workings have been cleaned out and placed in good condition; the lower adit is to be extended 200 ft. A body of lead ore is showing in this adit which measures 10 in. across and carries 19 oz. silver and 60% lead.—Tests are now being made in Denver upon the ore taken from where the Deming lode is intersected by the Moline adit. The first tests show a high extraction of gold and silver. The Democrat Mountain Co. will probably erect a plant with a capacity of 50 tons per day. It is intended to extract the gold and silver by amalgamation and then to concentrate the tailing on tables, so as to save the lead, zinc, and iron. Jerome Smith, of Georgetown, is manager for the company.—On the 150-ft. level of the Maud S. mine, on Douglass Mtn., a streak of rich silver ore has been exposed on the hanging-wall. The adit has been cleaned out and retimbered and is now being driven forward to intersect the vein at a depth of 150 ft. below the old workings. Steady shipments of ore are being made by M. Kelly, who is working the property under bond and lease.—Stoping is in progress upon the Edinburg vein, which was cut 300 ft. from the entrance in the lower adit. On the footwall a streak of lead ore 18 in. wide is showing; this ore assays \$22 per ton in silver and lead. On the hanging wall several feeders of high-grade ore are showing.—The compressor at the Sidney adit has been closed down for the winter, owing to insufficient water supply. A force of 12 men is developing the three veins in this property and considerable ore is being extracted. The adit was advanced during the summer months 975 ft., making a total distance of 2,950 ft. Regular shipments are being made of ore from the blind vein, which was cut 2,125 ft. from the portal. M. Sidney, the manager, states that work will continue during the winter.—A rich strike has been made at the Centennial claim, on Leavenworth Mtn., where David Kennedy, the owner, a few days ago found a rich pocket of gold-bearing ore only 8 ft. below surface. From 8 to 10 sacks are being sorted daily. The mineral is showing in the breast of the cut as well as on the floor; sinking is to be started soon.—Work was resumed this week upon the Plate property, situated on Griffith Mtn. The adit is to be extended for 100 ft. as considerable scattered mineral is showing in the head-

ing. Many years ago some exceptionally high-grade gold ore was mined near surface in this property. Wm. Aldred is owner of this mine.—A 6-in. streak of rich silver ore has been found in the Vorhees vein, on Democrat Mtn. The discovery was made 150 ft. from the adit entrance; the vein has been opened for 20 ft. Three tons of the ore were delivered to the local sampler last week. Robert Fisher, of Georgetown, is owner of the mine.—Sprouse & Co., leasing on the Commonwealth vein through the Wilcox adit, are mining considerable silver-lead ore. An average of one carload is shipped weekly, but it is hoped to increase the output during the next two weeks. A stope is 100 ft. long; the streak of ore is from 12 to 18 in. wide and assays \$40 per ton.—E. E. Grubb has taken a lease on the Annie May property, on Columbia Mtn. The adit, which is 70 ft. long, is to be driven 200 ft. farther. Several patches of sulphide ore are showing in the heading. The Annie May vein runs parallel with the Stemminder vein, where considerable rich silver ore has been mined during the past six months.

Georgetown, Dec. 3.

ESMERALDA COUNTY.

Federal troops arrived in Goldfield Dec. 7; these were sent from California. General Frederick Funston, commanding the Department of California, has gone to Goldfield to view the situation. Nevada is the only State in the United States not to have a State militia—a very fortunate circumstance at this time. All citizens, unionists and capitalists, respect Federal troops; they know that such troops are commanded by impartial officers, who have been trained to do their duty; they know that Federal troops mean, if they shoot, to kill. No local partisanship affects Federal action. We will be greatly surprised if violence is attempted by the union miners when the companies try to resume work at the mines. The controlling element in the Union at Goldfield is as wild and unscrupulous as any that was in Cripple Creek. The outcome at Goldfield when compared to the history of the strike at Cripple Creek will furnish, in our opinion, a conclusive proof of the superiority of white Federal troops over State militia in maintaining order in strike regions. Shortly after the arrival of the Federal troops the Goldfield Mine Owners' Association adopted resolutions announcing their determination to open their works on Thursday, December 12; they will operate on a reduced wage schedule and refuse to employ any miner who does not first renounce all affiliation and allegiance to the Western Federation of Miners. This is the long expected challenge to the Miners' Union and to the socialistic agitators from Colorado and Idaho, who have thrown themselves into this last bitter fight for supremacy in the Western Federation of Miners. The paragraph of the resolutions relating to the employment of union men is as follows: "That no member of this association employ in or around his mine or around his mill any member of Goldfield Local Union, No. 220, of the Western Federation of Miners, or of any union connected with or affiliated with said Western Federation of Miners, and that all men hereafter employed by any member of this association in or around his mine or mill be required as a condition of his employment to sign a written contract which contains an agreement that the miner is not now and will not be during the time he is working a member of Goldfield Miners' Union, No. 220, of the Western Federation of Miners, or of any other union in Goldfield or elsewhere that is directly or indirectly affiliated with or has any connection of any kind, nature, or description with said Western Federation of Miners."

The rate of pay is fixed as follows: Miners \$4, reduced from \$5; machine-men \$4, reduced from \$5; chuck tenders \$3.75, reduced from \$5; muckers \$3.75, reduced from \$5; car-men \$3.75, reduced from \$5; top car-men \$3.75, reduced from \$5; pump-men \$4, reduced from \$5; timber-men \$4.50, reduced from \$5; carpenters \$5, reduced from \$7; machinists \$5, reduced from \$6; engineers (licensed) \$5, reduced from \$6; electricians \$5, reduced from \$7; head blacksmiths, \$5.50, reduced from \$6; blacksmiths, \$5, unchanged; tool-sharpeners, \$5, unchanged; blacksmith helpers, \$4, unchanged; surface laborers \$3.50, reduced from \$4.50; amalgamators \$4.50, reduced from \$5; vanner-men \$4, reduced from \$5; labor \$3.50, reduced from \$5.

To answer the arguments that have been made by the miners that living in this camp would be impossible under a reduced rate of pay, the mine owners have announced their determination to cut the cost of living in Goldfield 20%. If the merchants maintain a stubborn attitude—and indications are that the new policy will be bitterly antagonized by the storekeepers and restaurant men—the association promises to construct and operate a general merchandise store or stores and boarding-houses "that will guarantee to the men employed in the mines and mills a reduction to this or even a greater amount." The opening of the mines on Thursday is expected to mark the opening of a bitter industrial struggle. The mine owners believe that they will have no trouble in drawing heavily from dissatisfied members of the union; and, in case the striking miners stand firm and refuse to go back to work on the operators' terms, men from outside sources will be obtained. The secretary of the association, William M. Erb, announced Dec. 10 that he had received applications for work from nearly every mining camp in the West, and he anticipated not the least difficulty in securing miners to fill every vacancy at every mine. John H. Mackenzie, managing director of the Consolidated company, has stated that in less than a year the Consolidated will have in operation a mill with a capacity of 500 tons per day. The present mills and numerous experiments on the ore have shown that Goldfield ores can be treated in the district efficiently and far more cheaply by cyanidation than by smelters. The company will make itself independent of the smelters and decrease its dependence on the railroads as much as possible.

The Goldfield employees of the Nevada-California Power Co. struck Dec. 11, refusing to accept the reduction from \$7 to \$5 per day. These are principally maintenance men and linemen. The electrical workers are affiliated with the American Federation of Labor and have no connection with the Western Federation of Miners; they had refused to strike in sympathy with the miners. This strike in itself will not affect the bringing of power from Bishop, California. As yet the men patrolling the power-line have not been notified of any reduction in wages; they will probably quit if so notified. In that case the power company would be greatly handicapped in furnishing the mines with electricity; most of the mines depend on electricity for power.

NYE COUNTY.

The ore shipments from the Tonopah mines for the week ending Dec. 5, as reported by the Nevada Ore Purchasing Co., were as follows: Tonopah company, 1,253 tons; Tonopah Extension, 195; Midway, 198; total, 1,646 tons. The Tonopah company sent 2,710, the Belmont company 1,200, and the Montana-Tonopah 1,100 tons to the mill. The total output of the Tonopah mines was 6,859 tons of an estimated value (assuming shipping ore worth \$70 per ton, milling ore \$30 per ton) of \$279,730.—Frank A. Keith has resigned as general manager for the Tonopah-Belmont company and will in future be the consulting engineer for the company.—The Montana-Tonopah 40-stamp mill is crushing at its full capacity, its output averaging 1,100 tons per week. Some rich ore is being added to the ordinary milling ore. Much development work is being done and the ore reserves are being rapidly increased.—At the Montana Extension the face of the west drift of the 600-ft. level is still in good ore; stoping continues on all levels above the 600 and the usual tonnage is being shipped. On the 1,050-ft. level the north cross-cut has as yet failed to cut a good orebody.—At the West End Con. the vein on the 200 and 275-ft. level is being prospected with good results. The customary tonnage is being stoped from the 400-ft. level. Early next month sinking in the new shaft will be resumed and continued until a depth of 500 ft. is reached.—At the Jim Butler the new air-compressor is working smoothly; air-drills are now being used on all the levels.—The strike at Goldfield has not affected Tonopah in the least.

At Round Mountain a vein, 4½ ft. wide, of good milling ore has been found in the Johnson lease on the Daisy property.—The Round Mountain Hydraulic Co. has completed its pipe-line to Jefferson canyon and the first monitor is now in operation; three monitors will eventually be used.

Heretofore ground sluicing has been employed; it is said that the clean-up from this sluicing was about \$500 per day. —'Dry washing' will soon begin on the Combination claim.

Another important orebody has been developed at Rhyolite this week. The new adit of the Golden Sceptre property has cut the Hobo vein at 230 ft. from the portal and at a depth of 150 ft. from surface. The cross-cut has passed through 8 ft. of lode without any signs of the other wall. The ore is a manganese-stained quartz so characteristic of Rhyolite. As yet no assays have been made on this ore, but 'pannings' indicate that the ore is of good milling grade. This adit passed through two other veins 10 to 15 ft. wide before cutting the Hobo, but they were not prospected. Driving both ways on the vein will begin immediately. —It has been announced that the Goldbar 10-stamp mill will be completed by Dec. 15. The only possible cause of delay will be the failure of the Nevada-California Power Co. to have the power-line to the mill completed by that date. Only a small amount of development work has been done at the mine while the mill was being built, but by Dec. 1 a full force of miners will be working again. —The Mayflower ores are being tested at both Los Angeles and Denver, and it is understood that, when the company is thoroughly satisfied as to the process best adapted to their treatment, a

associates have bought the control of the Transvaal of the Nevadas M. Co., whose properties (the Transvaal and the Congo) created quite an excitement when they were first discovered, about 18 months ago.

BRITISH COLUMBIA.

The shipments from the mining district of British Columbia for the past week were as follows: Boundary, 19 tons; Rossland, 6,400; Slocan-Kootenay, 3,705; total, 10,124 tons. —The Britannia mine has shut down, and it is stated that the Crofton smelter will be blown out in a few days. —The employees of the Trail smelter voted to return to the wage schedule in force prior to May 1. This vote insures continuous operation of the Rossland mines and the Trail smelter. —Wages have been reduced in the Slocan district to those prevailing prior to the advance made this summer. The miners have accepted the reduction.

BOUNDARY DISTRICT.

The Duncan mine, on West Fork, has shipped another car of ore. —At the Mother Lode mine, in Deadwood camp, only 16 men are working. —Driving has begun on the 300-ft. level of the Crescent mine, in Skylark camp. Ten men are working at the mine; M. I. Feeney is in charge. —At the Granby mines a complete underground survey is being made, as it is now possible to survey many places which can not be when mining is being done. C. M. Campbell is in charge of the surveying. —At the Brooklyn mine this week the pumps are again being driven by electricity; during the last month steam was used. —The spur from the C. P. R. tracks to the Gold Drop-Curlew claims, adjoining the Snowshoe mine, has been finished.

ROSSLAND DISTRICT.

The output of the Rossland mines for the week ending Nov. 30 was as follows: Centre Star, 3,635 tons; Le Roi, 2,240; Le Roi No. 2, 525; total, 6,400 tons. The new wage schedule at the mines went into effect Dec. 1. The wage of shovelers will be \$3 per day instead of \$2.75, as stated last week. The wages of shovelers were advanced from \$2.75 to \$3 May 1, and as that wage prevailed in May and June the wages of shovelers have only been reduced to \$3. —Considerable development work is being done in the mines of the Consolidated company. —At the Giant mine they are driving on the vein. The adit is being extended at the California mine; the shaft being sunk from the adit is now 150 ft. deep. —The operation profits of the Consolidated Mining & Smelting Co. for the year ending June 30 were \$484, 676. This company owns the Centre Star, War Eagle, and St. Eugene mines and the Trail smelter, as well as other but smaller mines in British Columbia.

MEXICO.

JALISCO.

A good body of copper ore, carrying some gold, has been found on the lowest level of the Carrizo mine, near Autlan. The ore is a sulphide and about 7 ft. wide. The El Refugio mine, near the Carrizo, has been bought by Stanislaus Ossolinski, representing a Chicago company. The ore at this mine is also a gold-bearing copper ore. Both of these mines are in the Ojo Verde barranca, far from a railroad, but an easy outlet can be obtained by means of a wagon road to Chamela, a port on the Pacific Ocean.

SONORA.

At present 500 men are working at the Greene-Cananea properties. —The Fay-Cananea company has acquired from the Cananea Eastern Co. its group of copper claims on the south slope of the Ajo Mtn. Over 1,000 ft. of development work, mostly adits, has been done at this property. Ten cars of ore assaying 10% copper were shipped from one orebody. The Fay-Cananea also purchased the Dorotea group a short time ago. —A small force of miners is working at the Democrata mine, doing development work. —El Tigre mine is working a full force of miners and some construction work is being done. —The Los Alosis mine, in the Tabatacochi district, has been sold to E. F. Kelly, of Los Angeles, Cal. The Los Alosis mine has been worked steadily for two years, and the ore shipped has paid for all development work.



Map of the New Mining Districts of Nevada and California.

contract will be let for a milling plant. The Mayflower has already a large amount of milling ore blocked out and the management thinks that the installation of a mill is thoroughly warranted. —Phillips & Moesser are preparing a shipment of ore from their lease on the Gibraltar, and will send it out as soon as the smelters are in a position to handle the ore. They have over four tons of high-grade ore which will assay about \$300 per ton; the rest of the consignment will be made up from lower-grade material which has accumulated on the dump. The lessees say that if there were a custom mill in the district that they could furnish a large amount of excellent milling ore. —T. W. Brock and associates have bought a large number of shares in the Tecopa Consolidated company. It is also stated that a smelter will be built at Beatty to treat the ore from this lead mine, which will be mixed with silicious ores from Rhyolite and Goldfield. The Tecopa mine is only producing about 60 tons of ore per day, as the company decided to curtail the output until the smelters made more prompt settlements. The company intends to build a spur from Tecopa siding, on the Tonopah & Tidewater railroad, to the mine. —Al. Myers and

Special Correspondence.

London.

A Nice Question Nicely Solved.—The Tomboy and John Herron.—Boston Con.—The Issue of Debentures.—Consolidated Gold Fields.

Is it right for a mining engineer while in the service of a company or of an individual mine-owner to take up adjacent claims in his own name? This is a question which is often asked in London, and the answer all depends on the point of view. Some engineers will say that as their services are only engaged for the management of a particular mine, the owner's claim on their services is confined to that particular mine; while others, with a larger-hearted conscientiousness, say that the whole of their mining knowledge and experience is engaged to their employer. It all depends upon the wording of the agreement between the engineer and the employer, but I am referring specially to the case where the agreement is dealing solely with the engagement in connection with a particular mine. The question has been raised this week by the mention of the case of John Herron, formerly manager of the Tomboy mine, at Telluride, in Colorado. Mr. Herron is an altruist and believed his duty to be to do everything in his power to promote the success of his company without considering his own personal advantage. It will be remembered that the Tomboy mine was floated in London some nine years ago, and within a year or two began to show signs of exhaustion. Mr. Herron early recognized the serious position of things, and without delay made a thorough investigation of other properties adjoining. He obtained a free option on behalf of his company on the Argentine group for 18 months, calling for the payment of \$60,000 at the end of that time. During those months he took out ore that yielded \$100,000 profit and disclosed further ore supplies that would yield a further \$250,000 profit. Up to the present time a total of over 500,000 tons of ore have been taken out of the Argentine, and a net profit of £343,000 obtained. There are ore reserves sufficient to last for five years now in the mine, and development work continues to be successful. It is estimated that for some years to come the dividends will average £100,000 per year. This is what Mr. Herron brought the company, and so far, the only extra honorarium he obtained was £2,000. Mr. Herron retired a year or two ago, broken in health, owing to the anxieties of the great strike, and owing also to some extent to the high altitude not suiting his constitution. It is with great pleasure, therefore, that I am able to record that the directors and shareholders are taking some steps to liquidate their obligation to Mr. Herron. At the stirring appeal of R. T. Bayliss, they have agreed to grant him an annuity of 1% on the net profits of the mine. This will work out at about £1,000 per year, judging by the figures given above. As Mr. Bayliss says, it is not much, not nearly as much as he would give him. For his sake, we hope that the mine may last a long time, and that he may recover his health in order adequately to enjoy it.

The directors of the Boston Consolidated Copper & Gold Mining Co. are not very popular with their English shareholders at present. This company is an English one, and it holds practically all the shares of the American company of a similar name, which owns and directs the operations at Bingham, Utah. A bare majority of shares in the English company is held by the controllers, so that everything can be rushed through by recourse to a poll, without explanation of the policy or position of the company. For instance, the creation of 100,000 new shares and the issue

of £252,000 of new debentures has just been authorized in this way. A meeting of shareholders was called this week in order to comply with the law, and the proposals were put before the shareholders with practically no explanation. The shareholders present were mystified at the position, and in absence of suitable explanation voted against the directors' proposals. The directors, however, mentioned that they had proxies for 311,000 out of 548,480 shares issued, so that settled the matter, and the shareholders present withdrew in disgust. The remarkable part of the affair is that only three or four months ago the directors announced the impending repayment of the debentures still outstanding, yet now they come and create a further issue of quarter of a million pounds. The mine and the metallurgical plant belonging to the company are well known in the technical world. In fact, both are too big and prominent features of the landscape for it to be possible for the directors to prevent the publication of information respecting them. But no official statement of the exact position of the company is ever issued to the shareholders. The shares have always been talked high in London and they have stood at £8 per £1 share. Six months ago they were £6, and now the quotation is below £2. It is foolish to give explanations of phenomena when we do not know the inside facts, but the appearances are that English shareholders who acquired vendors' shares at a high price are getting frozen out by the same people now that the mine is nearing a remunerative stage.

The Consolidated Gold Fields of South Africa, Ltd., is paying a dividend on the ordinary shares at the rate of 12½% for the year ended June 30 last, disbursing in this way the sum of £250,000 on the capital of £2,000,000. In addition the company paid the usual 6% preference dividend on 1,250,000 preference shares and 5½% interest on £350,000 debentures, besides redeeming £25,000 of debentures. During the previous two years no ordinary dividend was paid, nor was one paid during the years 1898 or 1901, and the year 1902-3. Though dividends were absent some substantial profits were made and nearly £2,000,000 added to the reserve fund. Of this sum, one-half is in Government securities and the remainder used in the business of the company. In addition to these amounts placed to reserve, considerable sums have had to be written off for depreciation in the market value of shares held in various companies. For instance, in the year under review, no less than £634,491 has been written off in this way. In the early days of the company, very large profits were made by flotations of subsidiary companies and by market transactions in shares in these other companies. More recently, however, hardly any business of this sort has been possible, and the income has been derived from the output of gold by the companies in which the Gold Fields holds interests.

Mexico.

Virginia Makes Payment.—New Mill.—Work at El Favor.—Makeever Bros.—The Jalisco Mining Co.—El Tajo.—The Navidad District.—Quicksilver.

It is learned with pleasure that the rumor to the effect that the Virginia & Mexico Mine & Smelter Co. would not be able to make payment, because of financial conditions, has proved false, and that the payment due last week has been met and the plans originally intended are to be carried out. The property referred to is the Cabrera, in the Hostotipaquillo district north of Ezatlan, State of Jalisco, which the Virginia & Mexico M. & S. Co. obtained last March from Carlos Romero, of Ezatlan, and is a part of the large area acquired by the latter last

been for several months, the tendency is to tighten operations and curtail expenditures. During the past week the company closed its big sawmill at Hamilton, and for the first time in years stopped work in the logging camps near Como. It is expected that other mills will be closed, and the prediction has been made for several months that by the first of January all the mines and smelters, mills, and logging camps of the Amalgamated in Montana would be closed tight. [Later dispatches state that all the Amalgamated mines have been closed down except those of the Boston & Montana group.]

Some of the new companies in the Butte district are still active and apparently have sufficient funds for the present. The companies in which W. W. McDowell and his associates are interested, are pushing development work. These are the Colusa-Leonard Extension, the Butte & London, and the Pilot-Butte. The last named made a high record for shaft-sinking in November, the total depth attained during that month being 125 ft. For a three-compartment shaft it breaks all records in the Butte district. At the end of the month the total depth of the shaft was 345 ft. All but about 20 ft. of it was through hard rock. Three veins have been cut in the Pilot-Butte shaft, the last one being encountered at a depth of 300 ft., the vein being about four feet wide. At a depth of 500 ft. cross-cuts will be driven to the veins and the expectation is that pay-ore will be found.

The Butte & New York Co., which is directing the work on the claims of the Butte-Milwaukee Mining Co., is still going on with the shaft-sinking on the Colonel Sellers and has reached a depth of 740 ft. At the 700-ft. point a large station has been cut and a 30,000-gal. tank is being placed there. Very little water has thus far been found and the placing of the tank is merely a precaution. The Colonel Sellers shaft is one of the best constructed three-compartment shafts in the district, and is in solid granite all the way down. Although the management of the company believes that ore can be found on the 700, it is the intention to do no exploration or mining above the 1,000-ft. level. A new first-motion Nordberg engine has been ordered by the company and will be on the ground shortly. A number of improvements have recently been made on the surface.

Later News.—Amalgamated Mines Shut Down.

At a meeting in New York last Saturday the directors of the Amalgamated Copper Co. decided to stop mining at all of the mines of the subsidiary companies in Butte with the exception of three mines of the Boston & Montana Co., and to close the big Washoe smelter at Anaconda indefinitely. As the same interests also control the North Butte and Butte Coalition, the mines of those companies were also closed completely. About 3,000 more men are thereby laid off at the mines and smelters, making the total laid off about 10,000 men. It is announced that the output of the three Boston & Montana mines would be somewhat increased and that the copper production of the Butte district would not be materially reduced below that of the past month. The Washoe smelter and the mines of the Anaconda, Butte & Boston, Washoe, Parrot, Trenton, Butte Coalition, and North Butte companies are affected by the farmers' suits for injunction now pending in the United States Court against the Washoe smelter. In view of the recent decision of the United States Circuit Court of Appeals in the case of the Utah smelters, it is feared that an injunction against the Washoe smelter will be granted, and that the present shut-down only anticipates a forced suspension by several months. If the injunction is granted, it will mean a suspension for a long time, probably several years. If the suspension depends only on the copper

market, there may be a resumption as soon as the demand for the metal improves. The orders from New York are being carried out and by the first of January the shut-down will be complete. The Boston & Montana is working only the Mountain View and East Colusa mines and a portion of the Pennsylvania, and is shipping about 1,100 tons of ore per day. The only other producers in the district now are the mines of W. A. Clark, which ship about 600 tons of ore per day, and the mines of the Pittsburg & Montana Co., which yield about 125 tons per day.

In the absence of John D. Ryan and John Gillie, heads of the Amalgamated Co. in Montana, there is no one to speak with authority for the company, but it is asserted that the shut-down is merely a transfer of production to the Boston & Montana in the interest of convenience and economy, the ore of the Boston & Montana mines being much richer than that of the other Amalgamated mines, and that to mine the Boston & Montana ore it is necessary to ship to the Great Falls smelter, as the company has a binding contract with the Great Northern railroad for the transportation of Boston & Montana ore. However, this explanation does not get around the fact that the very highest grade of copper ore is in the mines of the Anaconda, the North Butte, and Butte Coalition. The Boston & Montana cannot mine in the Leonard and West Colusa because of the fire in those properties. The Great Falls smelter has a capacity of about 8,000,000 lb. copper per month, and the company also operates a refinery there, having a capacity of 5,000,000 lb. per month.

Salt Lake, Utah.

Cut in Wages at Bingham.—Dividends.—The Bingham and Utah Con. Smelters.—The Gemini.—Ogden Smelter Shuts Down.—

The Mine Operators' Association of Bingham has announced that, beginning January 1, the scale of wages now prevailing in that camp will be reduced, making a difference all around of about 25 cents per shift. While the announcement has been received with a good deal of dissatisfaction by the miners, it is not anticipated that there will be any trouble about it, as the mining companies can easily fill the places of the men who do not desire to work under the new regulations. It will be remembered that about a year ago the mine operators of the camp voluntarily granted the men a raise of 25 cents per day; later, another similar increase was granted and was to remain in force while copper sold at 18 cents per pound or better. The new schedule cuts wages down to where they were before the second raise. In the notice posted about the mines the operators say the present scale will be restored whenever copper gets back to 18 cents again. A small force of men quit the employ of the Boston Consolidated a few days ago when the announcement was made, but the management of the company found no difficulty in filling their places.

The Uncle Sam Consolidated and May Day Mining companies posted their regular monthly dividends for December a few days ago, the amount being \$15,000 and \$12,000, respectively. The dividends are payable on December 20 and 23, respectively.—The Bingham Consolidated smelter will be closed in about a week, and then this company will be out of the smelting field entirely. The announcement was made some time ago that the plant would go out of commission and in the meantime energy has been put forth toward cleaning up the accumulation of ore on hand.—The Utah Consolidated Mining Co. is making a strenuous effort to secure permission from the court to continue the operation of its copper smelter long enough to build another one. A mass meeting of the farmers who appeared as plaintiffs in the late injunction

suit is to be held this week at which the matter will be discussed. A conference between the committee representing the interests of the farmers in the late controversy and attorneys of the company was held last week and the coming gathering is a result of it. The management of the mining company evidently realizes that it is futile to attempt to make any further effort to keep its smelting operations centred at Murray, but it is desired that sufficient time be granted to erect its proposed plant on the Tooele county site. It is believed the farmers will agree to this. It is claimed that it would take about a year to build a new plant.

The Horn Silver Mining Co. produced 1,250,000 lb. zinc during the past year. The mine has been closed for several weeks, however, its contract with the smelters having expired, and the latter refused to renew it on the former basis of settlement.—The installation of cyanide

preparing an address which will be sent to every member of Congress, to the governors of every State, the mayors of all the principal cities, the heads of commercial bodies, and to all the principal financial centres. The members of the committee are: Mayor John S. Bransford, Governor John C. Cutler, John Dern, C. C. Goodwin, William H. King, Thomas Kearns, Stephen H. Love, Charles A. Quigley, and M. H. Walker. This is a movement inaugurated with a view to bringing pressure upon the Government to coin 50,000,000 oz. of silver as a means of relieving the present financial stringency.

Denver, Colorado.

End of Important Litigation.—The Golden Cycle Mill Resumes Work.—Activity at Cripple Creek.

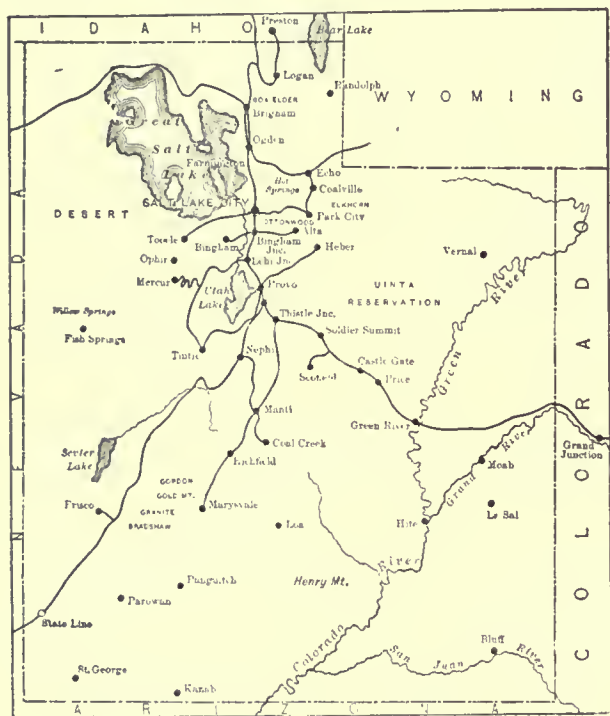
The litigation which has been carried on for the past three years between the Portland Gold Mining Co. and the Stratton's Independence Co., Ltd., was brought to an end by the decision of the United States Circuit Court of Appeals at St. Louis, December 5. The Portland Gold Mining Co. loses its suit to recover the value of ore to the amount of \$400,000, which it is claimed was mined unlawfully by the Stratton's Independence Co. from the Portland mines at Victor. The suits were originally brought in the Federal District Court at Denver. Only one of the suits was tried at St. Louis, and the decision there given upholds the action of the lower court.

The headquarters of the United Mine Workers of America has been removed from Colorado Springs to Denver. District No. 15 comprises Colorado, Utah, and New Mexico, and it was decided at the national convention held in Indianapolis last October that Denver would be more accessible from all directions. The offices are in the Commonwealth block. It is to be regretted that the change was not deferred until the El Paso coal strike had been settled. The conduct of such affairs is always steadier and more conservative under the direct supervision of the chief officials of the union.

On December 5 the Golden Cycle mill was re-opened for custom work. It has taken only 118 days to rebuild and, when everything is considered, the work has been accomplished with unusual speed. The capacity of the mill is now only 450 tons per day, but by January 1 the mill will be running up to its full capacity of 900 tons per day. The latest ideas in mill construction and installation are embodied in the new Golden Cycle plant. The ore is handled automatically throughout. Conveyor-belts have been substituted for elevators and the number of bearings has been reduced to a minimum. Several of the Cripple Creek mines had to close down when the Golden Cycle mill was burned last August. Most notable of those to resume with the new mill is the Findley, which is now producing 100 tons per day.

Everything seems to favor the increased activity in Cripple Creek. Miners are already coming in from Goldfield, because of the labor trouble there. It is estimated that at least 3,200 men are employed in the camp. The increased mill capacity furnished by the Golden Cycle of Colorado City is also a stimulus. For the month of November the production was 46,300 tons with a total value of \$1,091,050. This unquestionably places Cripple Creek first in Colorado mining camps. While this is an increase in value, it is a slight decrease in tonnage, owing to a temporary lessened mill-capacity and poor railroad transportation.

An organized movement is in progress to have a geological survey made of Summit county. B. Stanley Revett is active in circulating the petition, which, when complete, will be forwarded to Washington, asking that the United States Geological Survey undertake the work.



Utah.

equipment at the mill of the Jennie Gold mine in Iron county is progressing favorably and will be ready for commission early in 1908. The company has reported a strike of considerable importance on the 175-ft. level of the mine.—The working force at the property of the Newhouse Mines & Smelters Co. has been increased somewhat, but the mine is not running on the basis that it was before the late order for curtailment.

The Gemini Mining Co., of the Tintic district, paid dividends of \$20 per share this year, making a total of \$100,000. At the annual election held recently, John Q. Packard was chosen president; Edward W. Packard, vice-president; L. S. Hills, treasurer.—The plant of the Utah Smelting Co., near Ogden, has been closed indefinitely, and it is said the owners are willing to dispose of the plant at a fair price. The plant has been a success metallurgically, but financially it has been just the reverse. The company went into active competition with the other custom smelters of the Salt Lake valley and bought a great deal of ore when copper and lead metals were much higher than they are now, with the result that a large amount of money has been tied up.

The ore and bullion settlements reported through Salt Lake banks last week were \$430,000.—As a result of the silver coinage movement inaugurated in this city recently, the committee appointed for that purpose is

Wallace, Idaho.

Morning and Snowstorm Mines Closed.—No Curtailment at the Bunker Hill & Sullivan.—Rebuilding Tailing Dam on Canyon Creek.—Federal Company Dividend.—General Developments.

The closing down of some of the big mines has tended to cast a gloom over the district, but work on the development of the prospects is going on as merrily as ever. The closing down of the Morning mine at Mullan, owned by the Federal Mining & Smelting Co., has had a very depressing effect locally. The Morning mine is the second largest producer in the district and showed a net profit of about \$250,000 for last year. About 400 men have been thrown out of employment but, Charles Sweeny, the president of the Federal company, states that the shut-down is only temporary. The Federal company has also closed down the Corrigan mine in the Wardner district, and about 25 men have been laid off by this action. The Corrigan mine has never been a shipper and the shut-down does not come as a surprise. —The Snowstorm mine at Mullan, another of the big dividend-payers, has also closed down, and several hundred men have been laid off on this account. —A large number of prospects have also closed, but conditions are generally cheerful in spite of the gloom. Two feet of good ore has been encountered in the Mills property on Placer creek. The assay returns of the ore show $5\frac{1}{2}\%$ copper, 100 oz. silver, and \$10 gold per ton. A statement has been issued by Stanly A. Easton, manager for the Bunker Hill & Sullivan Co., the largest lead producer in the world, to the effect that there will be no curtailment in the output; this has had a reassuring effect on the Wardner district.

A force of men under the direction of Frank Franz, master mechanic of the Hercules mine, is engaged in strengthening and repairing the tailing dam on Canyon creek; it is the intention to practically construct a new dam just below the old one, so as to support it. Arrangements have also been made by the mining companies so that the O. R. & N. tracks are being moved a short distance north of their present position in order to afford additional dumping ground for the tailing. The expense of the work is being borne by the Frisco, Hecla, Tiger, and Hercules companies in proportion to the tonnage milled by each. —Work is being pushed at the property of the Liston M. Co. on Big creek, near Wardner; the adit is now about 40 ft. long. In addition to this the company has graded and built a four-mile wagon-road, connecting the mine with the O. R. & N. tracks. The machinery recently purchased from the Charles Dickens property will be hauled to the mine and installed at once. This consists of a compressor, boiler, engine, air receivers, and 2,500 ft. of iron pipe. In the meantime a contract for another 100 ft. of work has been let and development will continue without interruption. —A vein, seven feet wide, has been found in the Phedora mine; this is a high-grade lead ore carrying some silver and was cut in the drift at a point about 250 ft. from the portal. Recently a streak of ore, 10 in. wide, was found at still another point in the adit; this ore assayed about 30% lead.

A dividend has been declared by the Federal Mining & Smelting Co. payable December 15 and amounting to 7% on the preferred and 6% on the common stock; this amounts to \$210,000 on the preferred and \$90,000 on the common stock. —Work is about to be resumed on the Vienna-International mine after a shut-down of several weeks. Some time ago practically all of the company's buildings were destroyed by fire and these have been replaced by corrugated-iron structures. The mine is a

regular shipper and considered one of the most promising in the district. —The annual meeting of the stockholders of the Humming Bird Mining Co., was held at Burke and the following directors elected for the ensuing year: Harry L. Day, Dan Cardoner, M. J. Farrell, F. M. Rothrock, and H. F. Samuels. Another meeting will be held, and the company's officers will be elected from the above named directors. On account of the stringency of the financial condition it was deemed wise to suspend work in the lower adit. Part of the men were laid off and the remainder will be put on development work in the upper No. 4 adit.

David Gross, manager for the Temple M. Co. at Burke, has secured control of the Golden Winnie property near Murray. The amount paid has not been made public; it is understood that a company will be incorporated and



The Coeur d'Alene, Idaho.

shipments from the mine commenced at once. The mine is a valuable one as large deposits of tungsten are developed in it; some of these assay as high as 40%. The mine has been handicapped to a large extent by want of railroad facilities but the assurance of the building of the Idaho-Northern line into the Murray district within the next year or so will do away with that drawback. In the meantime it is Mr. Gross' intention to erect a concentrator at once and ship the higher grade ore after hand-sorting. The New Jersey company whose property is about four miles from Wardner has resumed work after a short shut-down and is running its 10-stamp mill at half-capacity. The other stamps will be started in a few days. The new shaft is being sunk where the gold vein is cut by the lower adit. At this point the gold-bearing vein is intersected by another carrying galena; this shaft will follow the footwall of the gold vein at the point of intersection of the two lodes. A large quantity of the gold ore is already blocked out. At the property of the Shoshone M. Co. on Nine Mile a station is being cut for the electric hoist, which will be used in sinking the new shaft. A large quantity of new machinery has been ordered for the mine and the power-line has been constructed.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

IN cyanide practice throughout the world about the only thing universally accepted is the principle of fine grinding.

AT the Broken Hill properties, Australia, 10,000 men are employed. The Broken Hill Proprietary alone employs 3,375 miners.

SLIME TREATMENT varies extraordinarily throughout the world. In Australia filter-presses are generally used to treat slime; in South Africa, agitation and decantation; in the United States, vacuum filters.

IN THE FOUR TUBE-MILLS being installed for fine-grinding ore from the Simmer & Jack mine, 'banket' is to be used instead of Danish pebbles; the mechanical engineers of the Consolidated Gold Fields have become convinced of the advantages of using banket for grinders.

AT the Tomboy mine, near Telluride, Colorado, the large rock-drills, which take two men to work them, are being thrown out, and one-man drills substituted. David Herron, the manager, estimates that just as much work is done by the small drill, with an economy of 50% in labor and 25% in air.

SUCCESSFUL amalgamation of heavy sliming ores requires that the amalgamating plates should be given a steep pitch and have frequent drops in them so as to keep the pulp in suspension and the plates clean. In amalgamating a heavy sliming mispickel gold ore, the plates were given a pitch of 24 in. per ft., besides being broken up into short sections.

THE ladder-ways in shafts are seldom used, therefore stagings should not be placed in the ladder-compartments for they restrict the flow of air through the shaft. If more attention was paid to the subject of ventilation and less time put on ultra-refinements of the surface-plant, the working efficiency of mine labor in, at least, the United States, would be greatly improved.

TO RE-HARDEN TOOLS that have been burned, they should first be cleaned. Then take common machine oil and forge cinders; make a bed of cinders, heat the tools, put them in the cinder bed, and pour oil over them until they are partly cooled off. Having put plenty of oil on the tools cover them with the cinders and ashes, burying them deeply. They should be left so for 12 to 15 hours.

WHILE some comment has been made on the vicissitudes of smelters, treating ore during a 'falling market,' still, as the smelters usually sell as much metal and bullion each day as will be recovered from the ore that they buy each day, this only means that their assets fluctuate by the amount of variation represented in their stock-piles. Stock-piles are generally accumulated in times of low metal prices and depleted in times of high prices.

AT the Tomboy mine, near Telluride, Colorado, magnetic separators have been installed for the purpose of treating the blende and pyrite middling left after the extraction of the lead in the first treatment of the concentrate from the stamps. This middling is roasted and sent to the magnetic separator with the result that the zinc and iron are separated, yielding a zinc product worth \$45 per ton, and a concentrate of iron containing 6 or 7% copper per ton; from five tons of middling two tons of

zinc concentrate is obtained and two tons of iron concentrate. It is estimated that this treatment of a product hitherto wasted will give an additional profit of at least \$1.15 per ton of crude ore.

THE filter-press for slime treatment still is supreme in Australia, but the vacuum filters are making inroads into its popularity. At the Great Boulder Perseverance mill experiments were made some time ago with the Moore process, but it was not adopted. Butters filter has been installed at the Sons of Gwalia mill; but the most popular filter is the locally developed Ridgway filter, which is used at several mills. The Moore process is in successful operation at Waihi, New Zealand.

THE powder bill at the Daly West mine, Park City, Utah, was reduced over a third by having all powder given to the men in the stopes by a powder-monkey. In the forenoon the powder-monkey caps the fuse and packs the powder into the pouches. In the afternoon he takes these different sacks to convenient points on each level; he then starts at the top and distributes the powder and fuse, noting the amount used by each miner. By the time one sack is empty, he has arrived where another sack of powder has been left.

THE RAND gold deposits are generally referred to as very uniform in character, but this generalization is very misleading. The reefs of the Main Reef series widen and contract, they flatten some places and steepen others; the gold content also varies, some places faults cut off the orebody, other places dikes come in to reduce the tonnage obtainable from a block of ground. Some of the mines on the Rand are wet, others are dry. It is dangerous to think that orebodies are uniform in character; their origin forbids such a condition.

CORNISH PUMPS are used at the property of the Berry United Co., at Ballarat, Australia. The diameter of the plungers of the new pump is 26 in. and there are three plungers in a depth of 600 ft. The pump has a maximum stroke of 10 ft., but it is being run at a 6-ft. stroke; the valve boxes are made in separate pieces instead of the usual H-piece; the valves are of the compound flat type. The total weight of the pump is 110 tons; its capacity is about 2,500,000 gal. per day. The old pump is 22 in. diam. and has a capacity of 1,200,000 gal. per day.

FASHIONS are as characteristic of mining as of milling. Once Tertiary volcanics were considered little worthy of prospecting, but Jim Butler discovered Tonopah and now such rocks are quite favorably considered. One district is characterized by one-man air-drills; in another district small machines are thrown on the dump. One mining company favors a Rand drill, another an Ingersoll-Sergeant, still another the Sullivan, and once in a while some company favors a Wood air-drill. Gold is where you find it; any standard make of air-drill is good.

A RIFLED PIPE-LINE, 256 miles long, is being built for the Southern Pacific Company to carry oil from the districts in Kern county to tide-water on San Francisco bay. Spiral indentations are rolled into the pipe while it is being made. The purpose of the rifling is to give the oil a whirling motion, water is added to the oil, and, as the water is heavier, it is driven by centrifugal force out against the pipe so as to form a surface layer between the oil and the pipe. The friction between the oil and this thin film of water is less than between the oil and the surface of the pipe and so the capacity of the pipe is somewhat increased and the power necessary for pumping is greatly decreased.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

Professional Customs.

[The questions to which reference is made in these letters will be found in our issues of October 5 and 19.—Editor.]

The Editor:

Sir—In regard to the series of questions given in your issue of October 5, it seems to me that, if a young mining engineer, desirous of undertaking the examination of a property involving \$100,000, be not sufficiently experienced to answer most of the questions enumerated, he is certainly not capable of undertaking the work. Young mining engineers, no matter how competent they may think they are (I can look back and see how my own head has decreased in size as the years have passed) are usually not capable of making mine examinations unless they have served a sort of apprenticeship to an examining engineer of experience. However, I submit the following answers to the questions, hoping they may be of some use to the younger generation:

1. Do whichever will pay best.
2. In case of an ordinary engagement, a formal contract is unnecessary, as the engaging of a man drawing a fee or salary such as a young engineer is likely to get, can be efficiently effected by the exchange of letters or telegrams. Here, as also with question No. 3, a great deal depends upon the sort of man with whom one is doing business.
3. It is customary to pay a portion of the traveling expenses in advance; also a portion of the fee or salary.
4. Equipment as such is certainly chargeable to expense account. The hire of surveying instruments may be charged, as most examining engineers do not keep instruments of that character. Even certain personal necessities may be chargeable, when the character of the trip is exceptional.
5. The question of traveling expenses opens up a broad field, and, having had a good deal of experience with young engineers sent out to make mine examinations, I find that what is proper is largely a matter of the individual, and the special conditions of the case. What is allowed by the employer is likely to be another matter. Speaking broadly, a man should be allowed to live in the manner to which he is accustomed, if that scale of living be not above the character of the job, that is, a man making \$100 per month should not incur traveling expenses on the same scale as the man who is making \$1,000 per month. For instance, D. H. Bacon, as head of the Minnesota Iron Co., traveled about in a private car.

(a) Tips, laundry bills, and tobacco are all legitimate expense items. Tobacco is not a luxury, though one of your correspondents states that it is. With most of us it is a necessity, due to continued indulgence; and after having succumbed to the subtle influence of the weed, we should prefer to go without a portion of our food, rather than to miss the after-dinner smoke. This applies more particularly when in the field than when one is seated in a luxurious armchair, with feet on the fender, stroking the cat, and thinking of the unfortunates who happen to be camping out at night in the cold north wind, their thoughts on the armchair, the fireplace, and the cat. A cigar is often the only thing that reconciles us to our lot, especially when we have spent weeks getting to a place to find the main workings under water, or—as often

happens—no main workings at all, except in the imagination of the Ananias who wrote the report.

(b) An examining engineer is entitled to a first-class passage on railroad train or steamer, but when it comes to "best first class," as your querist puts it, that depends on the position the man occupies. For instance, a young engineer would not be entitled to travel on the Cote d'Azur between Paris and Nice, on which the sleeping berth accommodation for one night is about \$20. Nor would he be entitled to take a stateroom with bath attached on the upper deck of, let us say, the *Lusitania*.

(c) This question reminds me of a commercial traveler whom I met in 1897 coming from Salt Lake City. He had started from Syracuse, N. Y., with \$500 for traveling expenses, and he told me he had spent \$50 to see the Corbett-Fitzsimmons fight, besides having had a 'night out' in San Francisco, all of which was to go on to the expense account under such headings as "Shaving" and "Entertaining customers." He shaved himself and did not entertain his customers. That man was a thief out of jail, one of thousands who juggle expense accounts with an easy conscience. It is obvious that no man has a right to make a profit on his traveling expenses.

(d) Young engineers should keep accounts in detail; they should insert as few incidentals as possible. An employer may think such items incidental, but not necessary to the furtherance of the business in hand.

(f) Expenses for entertaining are sometimes unavoidable, but should never be of sufficient amount to be put in as such. It is an item that is open to great abuse, and what is considered legitimate entertaining is again largely a matter of the individual, besides the drinking capacity of the man who is doing the entertaining.

(g) This depends on the distance the engineer is from his headquarters, and the amount of money that he has taken with him. If he be in close touch with his office, he should render expense accounts as often as the office desires. It is customary, where one is not too far away, to send in monthly accounts.

6. In case of mine examinations, never send progress reports of the investigation unless you are sure that they will not need revision.

7 and 8. This is merely a question of common honesty, and an engineer would be committing a breach of trust if he were to buy shares before his report reached his employer. The man who is paying the fee is entitled to the first information, and should have the first opportunity of taking advantage of it. If the engineer is of a speculative turn of mind, it is only fair to take his employer into his confidence and to get the latter's consent. After the work is completed, there is no reason why a man should not use his knowledge to his own advantage if by doing so he do not commit a breach of trust. In most speculations, he will lose his money, so, as Mr. Punch advised those about to marry, I say "Don't."

9. Generally speaking, unless considerable time elapse, the publication in technical periodicals of information gathered while making mine examinations will be more or less detrimental to the business of the man who sends the engineer out, but the advisability of doing so must be decided according to the individual merits of the case.

10. This question cannot be answered off-hand. Few engineers ever make direct and unqualified statements. Professor Egleston used to say, "It takes only one 'if' to bring you to the end of the world," and an engineer, after considering all the available data, should give a decided opinion as to the advisability or inadvisability of carrying out the particular project he is sent to report upon. He may condemn a potentially good mine, being unable to get sufficient information to warrant him

in making a favorable report, but in 999 cases out of a thousand, he will be right; so I believe that unless the information be *positive*, a report should be made *negative*.

As to clearing out old drifts, unwatering shafts, and opening up caved ground, except in case of a working option, such work is rarely warrantable at the expense of the people making the examination. Properly speaking, it belongs to development work. The owner of a property for sale should make the workings accessible to the examining engineer, because in most cases the expense of doing this is not warranted by the results obtained.

I would like to say that a young engineer—or an old one for that matter—should undertake an examination in a commercial spirit and endeavor to give value received for the money expended by his clients. His first consideration should be to spend as little of his client's money as possible, and when going on a mine, make the owners of that mine pay for everything possible. Under ordinary circumstances, the engineer should not undertake to pay for any labor or material, and he is usually entitled to transportation from the nearest railway station to the mine, unless the distances are great. He should be lodged and fed by the owner of the mine on the property.

The man who desires a report wants to know whether the information obtainable justifies him in putting up the money that is asked, and the cases are only too frequent where engineers advise their clients to expend money on prospects that do not warrant any expenditure at all. One often reads in reports that "there is every indication that the orebody will get richer and wider in depth." It takes more than the "ideal geological conditions" to make a mine. On the other hand, some men are prone to report unfavorably on everything when they are doubtful regarding any of the factors, and in their calculations they take the most pessimistic view of the conditions, their pessimism being largely due to their ignorance of the district, or perhaps it is because the mine has been condemned by other engineers before them, and they have not the courage to lay themselves open to making a possible mistake. In this way, a good property is occasionally passed over. An engineer should remain long enough on a mine to be able to say "Yes" or "No" regarding it, and taking the financial arrangements into consideration, his reply, to be of value, must be a definite "Yes" or "No." Most often his report will be adverse, but the man who succeeds is the one who can grasp the potentialities of a business and who, while giving due weight to the difficulties to be overcome, is not afraid to say unequivocally that the business is good. In no walk of life can it more aptly be paraphrased that "Wise men step in, where fools fear to tread."

C. S. HERZIG.

London, November 8.

The Editor:

Sir—Answering your questions for the benefit of young engineers, I would remark that I do not regard them as unimportant; in fact, most of them could not be answered except after years of experience, unless one can be willing to adopt the views of others which may have been communicated verbally, or by implication. Past experience governs the actions of all of us; for these same questions have come up in the career of every mining engineer. Necessarily, conditions might arise which would force the most experienced engineer to answer some of these questions differently from what he would ordinarily say. I do not think a proper and complete answer can be given to all these questions without knowing the conditions that surround each particular case. My own ideas, briefly expressed, are as follows:

1. A fee, which may be a lump sum or a *per diem* charge, is the usual and proper way for an engineer to charge for his work and it is only the older and best-known engineers who can charge a large lump sum.

2. A written contract is not necessary, but a letter is desirable and necessary, as verbal instructions are often subject to misinterpretation at some later date.

3. It is not probable that a lump sum to cover expenses could be named, but a certain amount should be asked for by an engineer, to be applied on account of expenses; and a reliable client will always do this without hesitation.

4. All the equipment necessary for the work is usually chargeable to the cost of examination, this not covering, of course, the usual instruments of precision which are in every engineer's kit. In other words, I do not think it proper to buy new barometers, compasses, and clinometers for an examination, unless the party paying the bills should specifically order that this be done, as is sometimes the case when equipment of this sort is needed at the mine. In such cases, only those articles which would be useful and necessary for the further operation of the property should be purchased, and this after specific instructions.

5. (a) All necessary expenses of travel are legitimate expense items, but certainly not such things as apply to the personal gratification of the engineer's tastes, such as tobacco or other luxuries.

(b) He is entitled to first-class passage on all transportation lines and the best hotel at each stopping-place.

(c) It is not right for him to charge the cost of anything which he does not actually use and enjoy.

(d) I do not consider it necessary for him to render an itemized expense account but be prepared to do so if asked for. Therefore, any method which he may employ of arriving at the total traveling expense, is proper, bearing in mind the hints above given.

(e) I do not see any reason for taking vouchers for expenditures made. If an engineer's employer does not rely upon his thorough honesty, no man, by receipts or vouchers, would change the character of his opinion.

(f) In the matter of entertaining men from whom it is expected to get information, some latitude should be allowed and real benefits derived should be paid for by the client, as in any other expense, but I would call attention to the fact that information obtained in this way is sometimes of questionable authenticity.

(g) Generally speaking, a statement of expenses incurred would naturally be rendered monthly in case there was any considerable amount expended other than the personal expense of the engineer. In most instances, it would probably be satisfactory to his employers to have his complete statement at the end of the examination. If exploratory work is being conducted during the examination, as might be the case in many instances, together with milling operations, for the determination of the value in the ore, it would naturally be more satisfactory for the engineer to send in a statement of his total monthly pay-roll, so that his employer might be informed in case the entire examination was likely to run up to a greater cost than was at first contemplated.

6. Periodical, or progress reports, are sure to be misleading. Positive conclusions cannot be stated until the completion of all sampling and mill-tests. The engineer's employers are entitled to such general information as may be unaffected by results obtained after further inspection, but a complete report is generally more satisfactory to the man of affairs than a series of partial and incomplete reports, which are subject to possible change or contradiction.

7. Any dealing in the shares of a company whose mine is under examination is not right until the engineer's report is in the hands of his principals. After completion of his report, there is no question but what a man has a right to buy shares in anything that suits him, but as a matter of fact the confidential relation set up between the engineer and his client does not end when a report is turned in and a thoroughly conscientious man will neither buy nor sell such shares without the knowledge and consent of his principal.

8. The examination of other properties in the same district, provided it does not interfere with his original line of employment, is perfectly proper. This would involve the separation of expense account carefully so as to prorate the same properly for his original employers. The taking of options at all by an engineer, during the progress of an examination, should not be done unless his employers wish it, or circumstances arise which make it distinctly to their advantage for him to do so. These matters touching the engineer's integrity and devotion to his employer's interest can only be decided by a rigid adherence to the rule of a perfect understanding between client and engineer.

9. Publication of a description of the district visited is certainly permissible, if his employers are notified and they do not object to such publication; but frequently any publication whatever, even of the fact that an engineer has visited the mine, is liable to prove detrimental to the business interests of the parties sending him there, and the young engineer should be distinctly cautioned against exercising his own unaided judgment in a matter of this kind.

10. It is not always possible for the engineer to say "Yes" or "No" as to the merits of a property on first examination. This is particularly true where old works require cleaning out before thorough sampling can be arrived at. It is almost invariably necessary, in the case of a large mine, to spend some money in unwatering, cleaning out old drifts, and possibly extending some of the workings by a few feet in order to arrive at accurate sampling. All these costs are properly chargeable, and the engineer must be the sole judge of the necessity for such work, but he must not be ambiguous in his statements nor "wobbly" in his conclusions. The engineer must exercise his judgment as to those matters which are positively necessary to enable him to arrive at sound conclusions, and his employers must rely upon his thorough honesty, else they would never employ him at all.

F. L. SIZER.

Helena, Mont., November 20.

The Editor:

Sir—In the 'Discussion' columns of your issue of October 19, the subject of 'Professional Customs' received attention. The queries and answers are very interesting and should be instructive to the younger members of the profession. While the ten questions asked cover a wide field, they are generalities and as such have been answered, but they suggest a friendly exchange of opinion from engineers interested in professional ethics, which is desirable. Any one of the ten questions, on closer analysis, invites liberal discussion. Take, for example, the first two clauses of question 10, "Is it always expected of the engineer to say 'Yes' or 'No' to the property? Even though the property is comparatively undeveloped, or badly opened, and the facts obtainable are insufficient for intelligent opinion, must the engineer always reach a definite conclusion?"

When all is said and done there is but one thing in a report which the would-be investor wants to know. He does not want to know whether such and such a bed

belongs to the Upper Carboniferous or to the Devonian; it matters little to him whether the ore owes its origin to lateral, ascending, or descending waters, to slow metasomatic replacement of the country rock or to the interaction of thermal and surface waters; he does not care for the fine differences between rhyolite and andesite as a country rock. What he wishes to find out is, whether he is justified in taking over the property and, if so, what returns can he expect on the investment. This is really the one object of the investigation, and for this purpose he employs the best engineer obtainable, or rather he should do so. And it is to this end that the engineer is trained; the years of study, hard work, observation, and experience must all focus on this one thing; it is the ability to determine rightly after a most careful study of the general geological and economic conditions for which an engineer is paid. He must weigh and re-weigh the merits of the property under examination, he must eliminate possibilities of failure and accurately interpret Nature's complex work. A report, no matter how exhaustive in technical detail, no matter how beautifully it may be illustrated and gotten up, no matter how fine the English, fails in its purpose if definite advice for or against the proposition is not given, or at least if the conclusions arrived at by the examining engineer are not so expressed as to leave no question in the minds of its readers as to what course to pursue. In a nutshell, a 'Yes' or 'No' answer, or a presentation of the facts that admit of nothing but a definite conclusion in the minds of the would-be investors, is essential.

For years I have made it a practice to preface my reports with my conclusions. This may seem an anomaly, but capitalists are generally busy men, they have little or no time to wander through pages of technical text unless the result of the investigation is favorable, so that a brief summary embodying the final conclusions facing the title-page is advisable. The reasoning should be sound, the *resumé* concise and clear, ambiguous terms should be avoided and but one interpretation of the meaning possible. The line of argument should be subsequently developed in the text, the basis for the conclusions clearly outlined, the why and wherefore explained, and all the factors that have determined the ultimate opinion should be dwelt on. It would be as great a piece of folly to express oneself positively without showing the reasoning for such decided opinion, as to acquaint the client with geological and economic data without pointing out their significance and what they might mean in dollars and cents.

I do not wish for one moment to belittle the importance or necessity for scientific reasoning. A report to be complete must show each step toward the final conclusion. It must be replete with detail even at the risk of being verbose. The layman investor does not like to wade through pages of mysterious and meaningless words, but it is highly probable that he will hand the report to another engineer for criticism and comment, in which case a lucid picture of existing conditions must be drawn in order that the inferences may be intelligible. It is most difficult to discuss technical detail in popular language, to express in plain English a line of argument based on scientific reasoning. The average readers of mining reports are educated men and will recognize the difficulty of the task. The logic of the reasoning will be apparent or can be determined, provided all the facts are accurately presented. Unfortunately, there is a class of misguided beings who resort to technical terms to cloak their ignorance, and it is no uncommon thing in these days of questionable flotations to find a so-called report on a supposed mining property reeking with drivel. A little knowledge is often dangerous.

I have expressed the opinion that a definite answer is required by a client from the engineer, but this presupposes that the engineer is in possession of all the details of the terms of the deal. Without this knowledge he cannot advise, or even suggest, as to the advisability of exercising the option. It is then necessary to so frame his report that those in possession of the details can, without hesitation, determine their own course. A property may be worth \$100,000 on a long-time working bond while it should not be considered for a moment, as a legitimate venture, if a cash price of twice the amount be asked. If the engineer is worthy of his hire he is worthy of his client's confidence, and all assistance should be given to enable him to intelligently size up the situation.

FRANK H. PROBERT.

Los Angeles, October 22.

[We have a few more letters to publish on this subject. No more replies to the ten questions are needed, but discussion of particular points will continue to be welcome.—Editor.]

Cyanidation of Ore Containing Both Coarse and Fine Gold.

The Editor:

Sir—Referring to your query, I had the precise condition at the Smuggler-Union of an ore containing much amalgamable fine gold but a larger amount of coarse gold, which was not amalgamable. After long and unsatisfactory experiments with various types of traps, we took pieces of 2 by 4, the length of the mortar lips, cut rectangular groove $2\frac{1}{2}$ in. wide by one inch deep the length of the 2 by 4, and closed the end, making a narrow trough. This was set at the head of each amalgamating plate where the pulp dropped directly into the trough from the mortar lip, thence overflowing onto the plate.

Once an hour the battery man went through the mill, picked up each of these troughs, inverted it, and struck it on the floor, knocking the contents out and replacing the trough. From this there resulted each 24 hours two half-barrels of highly concentrated pulp, which was then worked over a mechanical *batea* bought from the Allis-Chalmers Co. The bottom of this *batea* was always covered after such treatment with coarse gold, which was then fluxed and melted down into bullion.

Coarse and unamalgamable gold that gets into a concentrate is, of course, practically lost in the adjustments with the buyer, and the above is only offered as one method which got rid of a good deal of the difficulty.

C. W. VAN LAW.

Guanajuato, October 9.

The Editor:

Sir—The query is somewhat analogous to asking a doctor to prescribe for a person on the bare statement that he is sick. As the prescription would under such circumstances, if given at all, most likely be a physic, I am inclined to say: Amalgamate the coarse gold, this being the least apt to be wrong.

If the ore is stamped, and in water, plate amalgamation, with or without inside amalgamation, depending on the ore, the stamp-duty, and the shape of the mortars, would seem a reasonable thing to try, as it is so universally used for this exact purpose. If the ore is stamped in cyanide solution, copper plate amalgamation might still be the best way to get the coarse gold. We found it so at Bodie, and find it so at the Liberty Bell, though we have to renew our plates twice a year. Muntz metal I do not think much of. It will not catch the gold that copper will, and scours too easily, though it is

not attacked by the cyanide solution to the same extent that copper is.

With large roomy mortars and granular heavy gold, enough might be caught in the mortars themselves, so as to render subsequent plate amalgamation uneconomic, particularly if the pulp were run through large pansettlers of the Washoe type, after leaving the batteries. Were this done, a few flasks of quicksilver in the bottoms of the pans would help out wonderfully.

Pretty much the only remaining thing to do would be to try the merit of the idea advocated by the Denny brothers, namely, that of re-grinding the coarse gold in tube-mills along with the coarse sand, until it *will* go into solution. Tube-mills are certainly good amalgam traps, and it would seem likely that the gold would be finely divided before leaving them. However, to answer the query categorically, I will say that I would try out the various ways of catching the particular coarse gold in question, and adopt the method showing the greatest economy from the combined standpoint of recovery and cost.

EDWARD H. NUTTER.

Telluride, Colo., October 10.

Assessment Work.

The Editor:

Sir—Replying to your invitation to the prospector, I submit the following in relation to assessment work:

My personal knowledge is confined to conditions in the State of Nevada. The laws there have been so liberally construed that it is possible for a man to complete the work of locating a claim in one day. I have personally excavated the necessary 240 cu. ft. of earth in about five hours. Where the surface is fairly level and the material for monuments is convenient, the work of surveying and monumenting the ground may be done in a few hours. I grant that this is about the minimum. Perhaps a fair average for the entire cost, including the services of a competent surveyor, would be \$50. Now, a large majority of the men who have been busy in Nevada for three years were locators of ground rather than prospectors. If they found anything of value on the surface, well and good. They will attend to the assessment work on all such ground. Never fear about that. But not in one case in ten did they ever look intelligently and honestly for values. They did their location work where it could be done easiest instead of where they would be most likely to find ore. They are now waiting for somebody else to do the rest and make their holdings saleable. Such work has from the first been a great hindrance to real prospecting. The man who could find ore, and the means to develop it, is now waiting, in hundreds of cases, for the old locations to lapse. He will do nothing until he can get the ground he wants. He knows that the present holders will never do any work. He hopes that their time will expire on the first of January next; otherwise he must wait another year.

The prosperity of Nevada for one year depends very largely upon how this question is settled. Your correspondent, Edward A. Belcher, in your issue of November 30, does not exaggerate conditions as much as you may perhaps suppose. In fact, it would be hard to overestimate either the amount of flim-flam work that has been done or the damage to the mining interests of the State that has resulted from it.

H. G. HILLS.

Denver, December 4.

'RESCUE' is a Cornish mining term referring to the stripping of a vein, preparatory to breaking down the ore. It is used where the ore is narrow, rich, and frozen to one of the vein-walls.

Slime Treatment at Kalgoorlie.

Written for the MINING AND SCIENTIFIC PRESS
By M. W. VON BERNEWITZ.

At the Associated Northern mine the ore is of a schistose nature, with quartz and calcite; the valuable ore carries tellurides and iron pyrite, there being very little free gold.

The treatment consists of breaking the ore with a No. 5 Gates crusher, grinding through a 27-mesh screen in three No. 5 Krupp ball-mills, roasting in six Merton furnaces, mixing with weak cyanide solution, grinding to slime and amalgamating the coarse gold in eight Forwood-Down (improved Wheeler) 5-ft. pans, settling the slime in V-shaped boxes, agitation of pulp in five vats 22 by 6 ft., filter-press treatment in three Dehne presses, and disposal of residue by belt-conveyor.

The following is the treatment in detail of the pan product. Average screen tests of this are as follows:

Mesh.	Percentage.
On 30.....	Nil
40.....	Nil
60.....	0.5
80.....	2.5
100.....	4.3
150.....	4.9
Through 150.....	87.5

weak cyanide solution, and a water-wash of 5 minutes at 100-lb. pressure, during which time each ton of slime is washed by 2 tons of solution. The washing is done by a similar pump to that used in filling, only that it runs at 13 rev. per min. A mercury gauge is used on this pump. It sometimes happens that there is plenty of mill-water on hand, so the final water-wash is dispensed with, the press then getting 30 minutes with solution. The decrease in the assay-values of the solution during washing is:

Period.	Assay.
At start of wash.....	\$12.50
After 5 minutes.....	6.60
" 10 "	1.50
" 15 "	1.50
" 20 "	1.00
" 25 "	1.00
" 30 "	0.80

After washing, the contents of the press are dried for 10 minutes with air at 80-lb. pressure. The press is then opened ready for discharging. Two men empty 11 presses per shift of 8 hours, say 50 tons, onto a traveling horizontal belt-conveyor 18 in. wide, which feeds an elevator-belt inclined at 27°, in turn discharging onto a motor-driven swinging-boom distributor.

The time taken in the different press operations is as follows:



Kalgoorlie.

The slime from the settlers is run into the agitators with a consistence of about 1 to 1, it taking between 7 and 8 hours to fill one vat holding, say, 36 tons of dry slime. The cyanide solution is made up to 0.07%, and the consumption averages 1 lb. per ton treated. Agitation is continued as long as possible, but after 16 hours the pulp may be taken for filter-press treatment. For filling the press a Pearn pump having three plungers, 12 by 10 in., running at 20 rev. per min. is used. This is a powerful pump, and with good thick pulp it will fill a press in 10 minutes, lifting in this time about 10 tons of pulp, and charging against a final pressure of 60 lb. per sq. in. The time taken in filling may be divided as follows:

Pressure.	Minutes.
Up to 25 lb.....	4
" 50 ".....	3
" 60 ".....	1
Finishing with safety-valve blowing off at 60 lb.....	2
	10

The presses are of the wellknown Dehne make with fifty 3-in. frames for the slime, the usual cloth-covered high and low pressure plates for filtering and hand-screwing gear. They hold about 4.5 tons of dry slime each. After a press is filled, the slime is washed for 25 minutes with

	Minutes.
Filling press.....	10
Washing.....	30
Drying.....	10
Discharging.....	30
Screwing-up, etc.....	10

The rich gold solutions from the filter-press, after being clarified in a small press, pass through three zinc-boxes, and the gold (running about 890 fine) is recovered in the usual manner. Most of the solution, used in washing the presses, passes into the mill again to be used in the pans, etc. An average of three months' costs of slime treatment are as follows:

	Cost per ton.
Agitation and cyaniding.....	\$0.34
Filter-pressing.....	0.41
Precipitation, etc.....	0.12
Disposal of residues.....	0.04
Total.....	\$0.91

The mill has a capacity of about 3,700 tons of raw ore per month (say 3,200 of roasted ore) and with another 1,300 tons (previously roasted) from the re-treatment of old residue; altogether some 4,500 tons pass through the three presses monthly.

Monthly returns average about:

Ore milled, tons.....	3,700
Re-treatment, tons.....	1,300
Total value recovered.....	\$70,500
Profit.....	\$48,500

Tin Deposits of Cape Prince of Wales, Alaska.

By ALBERT HILL FAY.

*In giving a sketch of the tin deposits of Cape Prince of Wales, a short description of the geographic and climatic conditions may be of interest on account of this being a part of the world of which very little is known. As shown in Fig. 1, the Cape is in Lat. N. 65° 35' and Long. W. 168°. It is the westernmost point of the mainland of North America and across the strait one can see East Cape, Siberia, which consists of a rugged steep coast of granite cliffs.

During eight months in the year no boats can reach Cape Prince of Wales. In the summer the United States mail arrives twice a month; and in the winter there is a weekly mail service from Nome. The winter mail is carried on horse-sleds from Valdez to Fairbanks over the trail shown in Fig. 1; thence down the Yukon river to Kaltag; across the portage to Unalakleet; and along the coast line to Nome and Tin City. From Fairbanks to Tin City the mail is carried by dog-sled. The total distance from Valdez (the winter seaport) is a little more than 1,400 miles. Mail from the United States will reach the Cape in from 60 to 80 days. There is a telephone line to Nome, where it connects with the United States military telegraph line to Seattle.

The summers are comparatively cool, 60° F. being the highest temperature, while 45° is about the average from June 15 to September 15. At Cape Mtn. during at least one-half of the time there are heavy fogs and drizzling rains, which make it bad for all outside work. The wind adds to the inclemency of the weather. Freezing temperatures, with snowstorms, usually set in about September 15. Navigation for small boats from Nome is uncertain after October 20. By December the sea is usually sufficiently frozen to permit traveling by dog-sled on the ice near the beach. The winters are noted for severe blizzards of snow-ice and high winds. Yet the temperature does not drop so low as in more inland places. The lowest temperature for the winter of 1905-6 was -45° F. During such a blizzard, which may last for 10 days, it is almost impossible for man or beast to endure the icy blasts as they hurl themselves upon him from the polar regions. The changes in temperature are very sudden. In 24 hr. during January 8 and 9, 1907, there was a drop of 43°, and the maximum range for the period observed was 102°. February was a cold month, with a continuous blizzard lasting about two weeks.

During seven months of the winter the climatic conditions permit little, if any, outside work, although freighting, such as hauling ore, could be performed during about half of the winter season. Underground work can be carried on without difficulty during the entire winter, but it is absolutely necessary to get all supplies in before October 1. The ground is frozen deep, and some prospect-shafts and tunnels from 80 to 100 ft. below the surface are still in the frost-zone. No well-water has been found; and, for domestic purposes, the supply comes from thawing the snow as needed. Water can be obtained near the beach at a depth of 12 ft., but it is too salt for any purpose other than milling. A supply of water for mill use during the summer can be obtained from the melting snows on the mountains, and needs no pumping.

Any concentrating-plant in which water takes an important part can be operated only during four months in the summer, since cost of fuel will be prohibitive in winter.

Fig. 2 gives a good idea of the topography of this portion of Seward Peninsula. When the geology of the country covered by the map, Fig. 3, is interpreted we are led to the belief in a distinct eruptive period, followed by a long time-interval, during which erosion has played an important part. The western end of the mountain, next to the Cape, consists of a granite knob 2,300 ft. high, known as Cape mountain, which rises so abruptly from Bering sea that there is not enough strand even for a foot-path. To the north the mountain slopes gently to the Arctic ocean, where there is a broad margin of low ground, formerly sand-spits, but now covered with tundra. These sand-spits are still forming, and enclose



Fig. 1. Sketch-Map of Alaska.

a series of lagoons along the coast, the largest one being known as Lopp lagoon. East of Tin City there is a broad tundra covered plateau extending to the York mountains, with an elevation of from 300 to 400 ft. above sea-level. This plateau is very much dissected by short valleys extending north and south, which, during the summer, are water-ways for the small streams. On the western side of this plateau, and against the granite mountain-mass, are three limestone terraces, which have the appearance of ancient beach-lines. The lower one is now very near the present beach, and no doubt the present narrow margin along the coast is, in places, of very recent formation. The upper terraces I am inclined to consider as the remnants of a monocline—or the west limb of an anticline, in which the erosion has progressed westward from a N-S axis of uplift. Six or eight miles east of these terraces, which are near the granite-lime contact, the strata dip in the opposite direction, and thus indicate the presence of the two limbs of an anticlinal fold.

The surface of the mountainous portions shows the effect of frost. The freezing and thawing process has gone on so long, and the outcropping rocks have been broken up to such an extent, that the surface is covered with loose fragments to a depth of from 5 to 20 ft. On

*Abstract from a paper entitled 'Geology and Mining of the Tin Deposits of Cape Prince of Wales, Alaska,' by Albert Hill Fay. Bulletin No. 17. American Institute of Mining Engineers.

the steep slopes this débris creeps so much that when float-ore is found, one can hardly even guess its point of origin. Except for some of the granite monoliths and an occasional limestone cliff, outcrops are scarce, making prospecting difficult.

The granite is coarse and light colored. The feldspar

There are four places where there is still some limestone on top of the granite, as shown in Fig. 3. Toward the top of Cape mountain, as well as near the Indian village, the limestone becomes more shaly, and even schistose in character.

Near the beach the contact between the limestone and granite is vertical, and about two miles farther north it dips east 80° . One-half mile farther to the north it dips 60° W. The slickensides show that some movement has taken place along this line. In addition to the main contact, there are occasional bodies of limestone which have been caught in the molten granite, and are now held as inclusions. It is alongside one of these that the best tin-ore has been found. This particular body of limestone is about 20 ft. thick.

At a number of places on Cape Mtn. a little tin float has been discovered, but not enough to be of importance. The deposits are small, as far as present developments show. Much of the granite carries traces of tin, and occasionally small stringers of cassiterite exist

crystals vary from a small fraction of an inch to 2 in. long. The hornblende crystals are few and small, and biotite is the prevailing dark mineral. The main body of granite has the appearance of a boss, on the top of which is a lime and shale cap. From this boss extend intrusions into the lime between the bedding-planes, and form sills which are nearly horizontal. There are also vertical dikes, from a few inches to 30 ft. thick, radiating from the central core and extending into the lime. These dikes appear to have the same texture as the granite along the main contact, and are probably contemporaneous with it. At one place I found a dike of rhyolite-porphry cut through the coarse granite. The contact between the two masses is sharp and showed no decomposition of either. At the contact the rhyolite and granite were actually fused together.

There were at least three periods of disturbance after the deposition of the limestone: 1. Eruption of the main granite mass. 2. Intrusion of rhyolite dikes. 3. Intrusion of basalt dikes.

After the limestone had been deposited came the great uplift, which formed the mountain and tilted the limestone beds. Then came a period of rest and the whole mass solidified. Following this was a long time interval, during which erosion played an important part. Then came the intrusion of rhyolite dikes, as mentioned above. I also found one basalt dike which cut through both the granite and lime, at the contact of the latter. No place was found where the basalt and rhyolite dikes cut each other; but, on account of the acidity of the rhyolite, it is probably the older of the two. The basic rocks have a lower freezing-point. It is not at all likely that the acid and basic dikes were intruded at the same time, for the two observed were only a few yards apart.

The limestone still retains its bedding-planes and is generally of fine grain and bluish color. In places near the contact with the granite it has become crystalline, while at others it is more silicious, with stringers of quartz between the bedding-planes; a large amount of the lime at the contact near the beach, as well as at the contact near the top of Cape mountain, has altered to wollastonite.

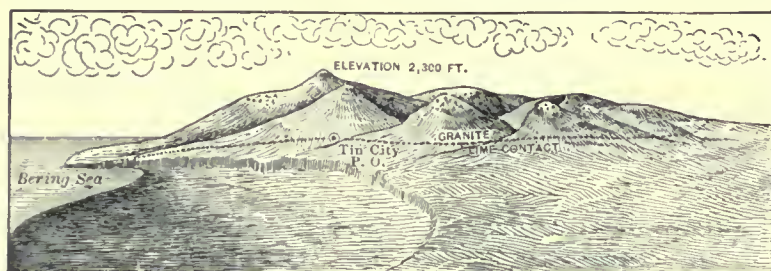


Fig. 2. Cape Mountain.

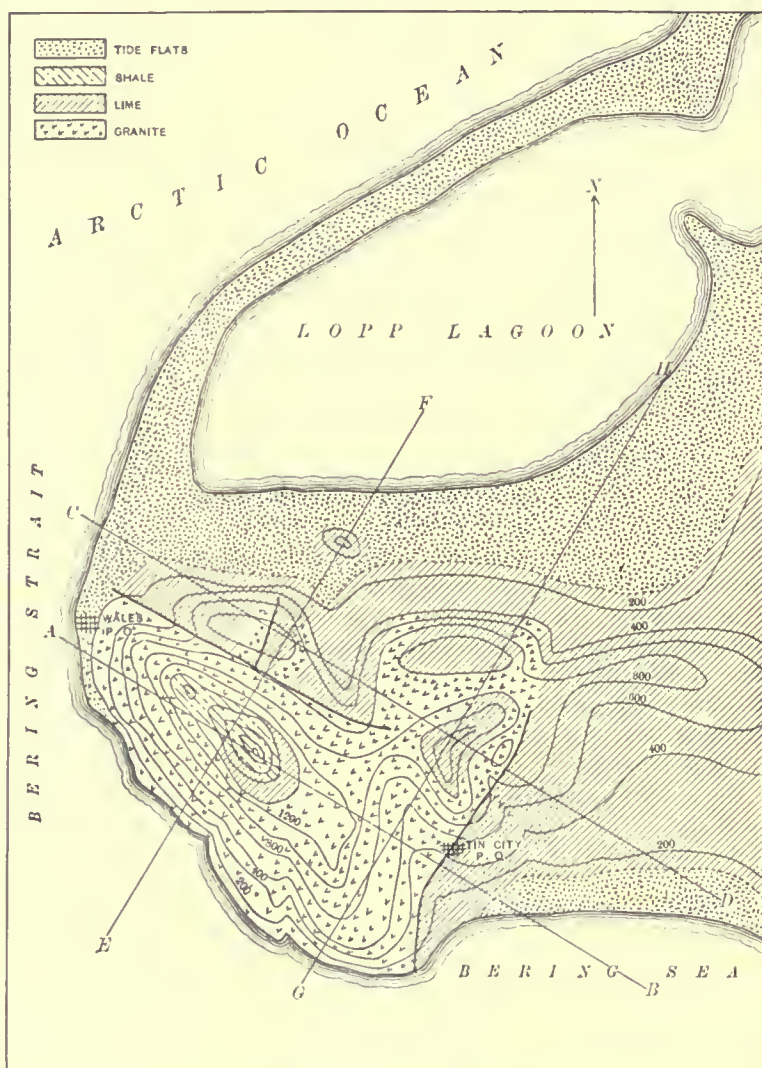


Fig. 3. Geological Map of Cape Mountain.

(Scale: $\frac{1}{4}$ in. = 1 mile)

along small fractures in it. In one case a stringer from 1 to 2 in. thick was found which was nearly vertical. This stringer passed through the granite, and also along the bedding-planes of the limestone, showing the tin to be later in origin than the limestone.

The cassiterite in the limestone was crystalline and exhibited good faces. Associated with it was quartz and limonite. The stringer of cassiterite in the granite was

more massive and had the appearance of a local enrichment. There was no marked line of contact; the centre was almost pure cassiterite, and passing from this to the granite the tin oxide seemed to give place to the biotite and feldspar until the normal granite was reached on either side. At one point of contact there is an iron selvage varying from a few inches to 4 ft. thick. The iron oxide (limonite) is quite pure and contained no tin. The tin at this place seems to be in the granite.

Along this granite-limestone contact there is an excellent example of the formation of tourmaline. All the necessary conditions are provided. The granite above the limestone lies almost horizontal, and must have provided, when in the molten and viscous state, practically a reverberatory furnace. This overlying mass, by reason of its weight, would retain emanating gases under pressure. All the constituents of tourmaline are at hand; lime in the limestone; iron, magnesium, aluminum, sodium, potassium, boron, and silicon in the granite. Boric fluoride is very readily absorbed by water (700 volumes of BF_3 to 1 of H_2O), and in this way it may have been supplied by the crystallizing granite. The tourmaline has formed on the lower side of the granite and exhibits well-developed crystals in quantity. As depth in the granite is gained, the amount of tourmaline diminishes. Below the tourmaline-granite, and resting immediately on the limestone, is a quantity of filling consisting largely of limonite and free quartz. This iron has undoubtedly been precipitated here as a sulphide, and is now the product of oxidation. This change has been wrought when climatic conditions were milder than now, for it is all in the frozen zone.

The presence of an occasional stringer of cassiterite in the granite, now in place, would indicate that the float tin-ore on the surface is simply a residual product of decomposition of the granite. It might be used as proof that there are still rich bodies of ore here; but it is more reasonable to regard the float as representing stringers and veinlets that have existed in bygone ages. Erosion has been great, and it is not an easy matter to say to what extent these deposits have been carried away. Placer tin is found in many places on the Seward Peninsula, and no doubt has the same origin.

On the whole, not enough work has been done to obtain much information concerning the size and continuance of the deposits. All that can be said now is that they are not large enough to pay to work. Some of these stringers may improve as depth is gained, but that remains to be seen.

The assay was usually made on 100 gm. of pulp of 60-mesh size. This pulp was carefully panned until most of the gangue had been washed off, leaving a concentrate of about 10 gm. containing cassiterite, with small amounts of pyrite, iron oxide, and tourmaline, together with the material clinging to them. This concentrate was then digested in nitro-hydrochloric acid for an hour, or longer, until all the soluble parts were dissolved, leaving most of the tin oxide reasonably clean. The residue, containing some quartz and tourmaline, was then thoroughly washed, dried, and weighed. A fire-assay on a number of these pannings gave an average of 70% metallic tin, while pure cassiterite contains 78 per cent.

By practice and careful work in the panning and acid-treatment, uniform results can be obtained. I made 300 tests on various samples in this manner and considered my final concentrate as 70% metallic tin. Though not absolutely correct, this method of assay is sufficiently accurate for testing rock, float, grab-samples, and prospectors' samples. Moreover, when at a distance from a

well-equipped laboratory, the best use has to be made of the tools and supplies that are available.

The charge for the fire-assay was made up as follows: 10 gm. of concentrate from ore was thoroughly mixed with 40 gm. of KCN (98%); 5 gm. KCN was placed in the bottom of the crucible, the charge then added, and covered with 5 gm. KCN. The time of fusion in gasoline furnace, from 15 to 25 min., gave a metallic tin button ready to be weighed. No analysis of the tin button was made to determine its purity.

Of 36 samples of granite, 13 contained a trace of tin, while 23 showed none. Those that had any tin whatever were nearest the contact, or, in other words, in the outer shell of the granite. Phillips and Louis, in describing a mine in New South Wales, report that "the tin-bearing portion of the granite is practically confined to a belt that forms the outer crust of the boss."[†] The portion of the vein-matter which could be taken as ore for treatment has a very low tin-content.

Down to the present time but little mining has been done, although there has been considerable prospecting by a half dozen concerns. A large part of this prospecting has been in the shape of open-cuts and costeaning trenches, in the endeavor to find the lode from which the float-ore has come. The surface of the ground consists of so much loose earth and boulders that it is difficult to obtain good results from open work. During the short summers, the ground will thaw only to a depth of from 3 to 4 ft.; and, below this, the digging is very hard. If the open-cut is on level ground, the melting ice and snow will flood it with water, so that it is necessary either to abandon the work, or to put in a pump, before bedrock can be reached.

Prospecting has been carried on continuously since 1902, the largest operations being those of the Bartels Tin Mining Co. The mining work consisted of a large number of open-cuts from 10 to 100 ft. long, many of which, however, did not reach bedrock; a number of short tunnels and two shafts—one 80 ft. and one 40 ft. deep. In two or three places some cassiterite was found in place. The surface improvements consist of two bunk-houses, two warehouses, a barn, a blacksmith's shop, and a power-house for electric drills. A Merrill 3-stamp mill was installed two years ago, comprising one 25-hp. Model gas-engine, a Blake crusher, a hydraulic classifier, and two Wilfley tables. The plant, which has a capacity of about one ton per hour, was operated during the summer of 1906, and a small shipment of concentrate was obtained. The next largest company operating is the U. S. Alaska Tin Mining Co., owning a number of claims on the north slope of Cape mountain. The underground work consists of one small and shallow shaft, and a tunnel about 250 ft. long. A 10-stamp mill has been installed. During the summer of 1906, Risley & Arrow-smith did some prospecting by the use of the calyx core-drills. Several holes were bored to a depth of from 50 to 100 ft. through lime to the granite contact, but I do not know what results were obtained. There are several minor prospect diggings, but they do not seem to be important or prominent.

The Gilday ventilating machine has been tried with great satisfaction at several mines in Australia. This ventilator consists of a belt-driven propeller shaft rotating in a tube. The vanes are helical surfaces, whose pitch is the length of the machine. The direction of flow of air is approximately axial, the diameter of the propeller is about 3 ft. The machine is run not to blow air into the mine but to suck the bad air out.

[†] 'Treatise on Ore Deposits,' Phillips and Louis, p. 668 (1896).

Faulting in the Red Cloud Mine.

Written for the MINING AND SCIENTIFIC PRESS
By H. W. TURNER.

The Red Cloud mine is situated in the Wood River district, Idaho, in the Deer Creek drainage, about seven miles due west of Hailey, the county seat of Blaine county.

This district has long been famous for its lead-silver

N. 50° W., and dips southwest at an average angle of 60°. The ore in the main vein came chiefly from the stopes to the south of the junction of the two veins.

Faulting has occurred on a small scale at numerous points in the mine, but the two movements that have affected the orebodies to the greatest extent are those herein described.

To illustrate the faulting, three sketches have been prepared. On these, only those features are shown that

are exposed in the mine workings. Thus, the main vein on Fig. 3 does not appear between points X and Y, because it is not exposed in No. 6 adit between these points. Likewise the hanging-wall vein on No. 6 level is not shown as uniting with the main vein, as the point is not proven by actual work on this level, although the two veins must really join on No. 6 level, as they are proven to do on No. 5 level above and No. 7 level below. An exception was made in case of the gouge seam shown on Fig. 3. This is exposed only at the west ends of No. 8 level, No. 9A level, and in No. 10 level. No. 9A level is 15 ft. above No. 9 level.

The fault with the greatest throw is that shown in Fig. 1. A block of ground containing the upper levels of the mine has been shoved N. 20° W. a distance of about 240 ft. along a slip dipping northwesterly about 8°. This fault, or slip,

veins, the galena always carrying silver. The deposits are true veins occupying distinct fissures. Since the formation of the veins the rocks of the region have been extensively faulted, and the fact that a number of important mines are idle is due chiefly to the veins being lost, that is, cut off by faults. In certain cases, by judicious exploration, the veins have been recovered and production continued.

The Red Cloud deposits are in a calcareous shale, which has been shown by Waldemar Lindgren* to be of Carboniferous age. There are several veins on the property, but the two referred to in this paper are the only ones that have been developed extensively. The ore was an argenticiferous galena with some blende and pyrite, and according to Mr. Lindgren, also arsenopyrite.

Between 1880 and 1902, the Red Cloud mine produced ore of a gross value of \$815,802, as shown by the original records of the company in the possession of Judge Lyttleton Price, since deceased. Of this production, \$680,424 came almost entirely from the main, or Red Cloud, vein and nearly all the balance, or \$135,377, from the hanging-wall vein. The total product was 5,141 tons of lead (59.39%), 511,331 oz. silver (59.7 oz. per ton), and some gold, especially in the hanging-wall vein. Under the Kennelly lease, ore was extracted almost entirely from the stopes on the hanging-wall vein, 1,952 tons being shipped, containing 709 oz. gold, or 0.36 oz. per ton. The ore of this stope contained pyrite, and the gold is said to go with the pyrite.

The property was worked through adits for a vertical distance of 1,065 ft., but practically all the ore extracted came from above No. 9 level, which is only 706 ft. below the surface as measured from the mouth of No. 1 adit.

Two veins have produced practically all the ore. These are the main, or Red Cloud, vein and the hanging-wall vein. The former runs the entire length of the Red Cloud claim, and probably even farther south, toward the Red Elephant mine. It strikes about N. 23° W. true meridian, and dips westerly at a high angle, being in places nearly vertical. The hanging-wall vein branches off from the main vein to the northwest. It strikes about

ground containing the upper levels of the mine has been shoved N. 20° W. a distance of about 240 ft. along a slip dipping northwesterly about 8°. This fault, or slip,

*Twentieth annual report of the U. S. Geological Survey, p. 234.

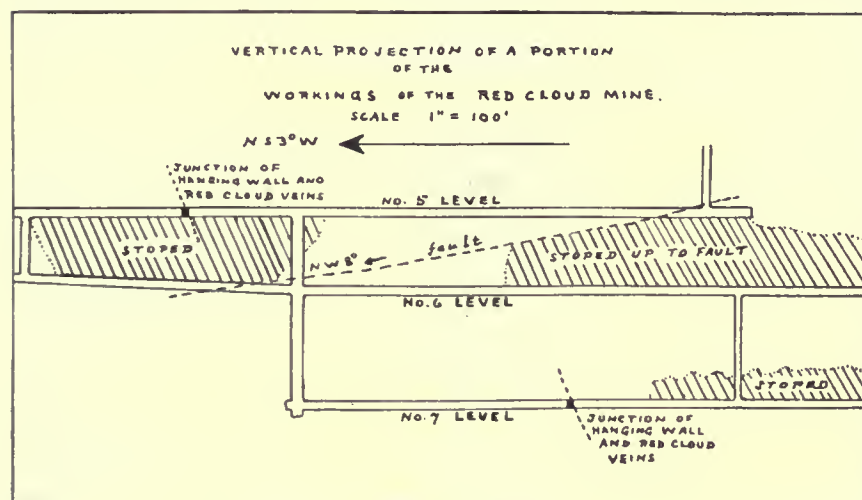


Fig. 1.

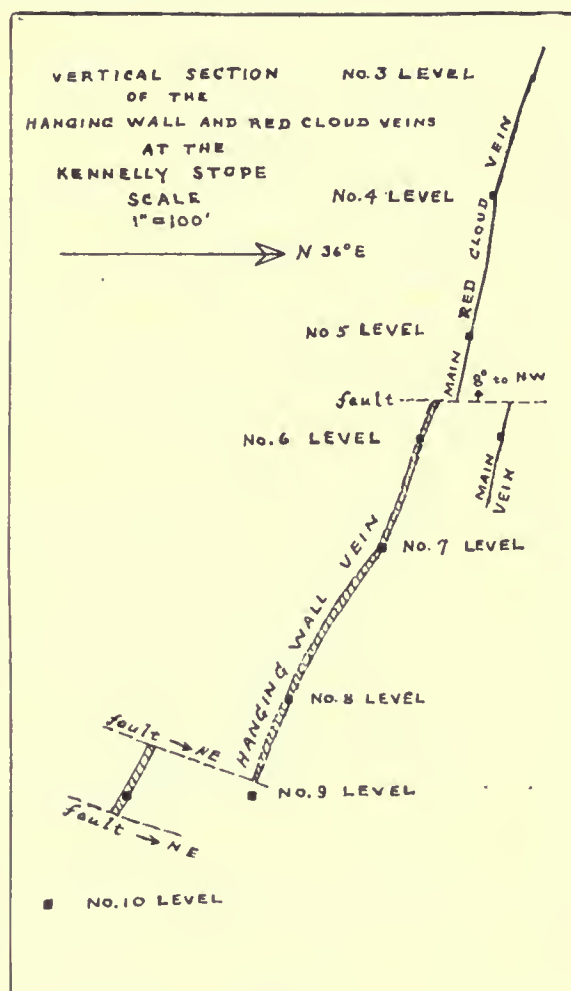


Fig. 2.

cuts both No. 5 and No. 6. levels, and is best seen at the south end of No. 5 level, where the ore was stoped to the slip. By following the old stopes, the fault sur-

face can be seen finely exposed for study, as it everywhere forms a roof to the stope.

The vein known as the hanging-wall vein branches off to the northwest from the main vein, and the point of its junction with the main vein is shown on Fig. 1, on No. 5 and No. 7 levels. In consequence of the faulting above described, the upper portion of this hanging-wall vein has been thrown northwesterly about 240 ft., which determines the throw on this fault-plane. On No. 6 level, in consequence of this movement, the hanging-wall vein appears twice, as shown in the horizontal projection of the workings in Fig. 3. The stope A, No. 6 level, represents the portion of the vein in the thrown block, and this stope is a continuation of the Kennelly orebody, although now 240 ft. to the northwest of its original position.

About the time the stopes of the main Red Cloud vein were exhausted the Kennelly ore-shoot on the hanging-wall vein was opened up, and the vein was followed down to No. 9A level, about 15 ft. above No. 9 level. Drifts on No. 9 level failed to find any vein or ore. Subsequently a cross-cut driven to the southwest encountered the vein, and it was finally demonstrated that the vein had been thrown 90 ft. to the southwest along a slip which inclined upward approximately 15° (see Fig. 2). The vein in this block was stoped to the fault, but in underhand stoping below No. 9 level it was found that the vein was again cut off by another slip, probably parallel to that above.

Considerable work was done on No. 10 level, and in the drift shown in cross-section on Fig. 2, on No. 10 level, some easterly dipping seams were found containing pyrite and zinc-blende, and one seam with lumps of argentiferous galena, which may represent drag ore. The hanging-wall vein itself was not, however, found on No. 10 level, although it is likely that a cross-cut run to the southwest from No. 10 would soon encounter the vein.

A gouge seam (see Fig. 3) on No. 8 and No. 9 levels cut off the vein to the north. This gouge seam has a nearly north strike and dips easterly about 68°. It represents a fault with a N-S trend on a different plane from those of the faults above described.

It is absolutely demonstrated in the Red Cloud mine that the veins are displaced by two marked monuments. One of these threw a block of ground above No. 6 level 240 ft. to the north, and another at about No. 9 level threw a block of ground 90 ft. to the southwest. It is also evident that this movement was repeated just below No. 9 level, the vein again being thrown, presumably in the same direction to the southwest.

At a point 1,065 ft. vertically below the mouth of No. 1 adit, a cross-cut 1,773 ft. long was run in an easterly direction. This cut a strong gouge seam containing calcite, and showing, by washing, some grains of sulphides.

This gouge seam has a course N. 10° E. and dips southwest at about 45°. It was known as the Yellow Dog vein, and was followed by a drift for 580 ft. From this drift another cross-cut was extended east a distance of 435 ft., when a second vein was encountered and a drift, known as the Kelly, was run on this vein for about 530 ft. At one point, a few tons of galena containing 100 oz. silver per ton, were extracted. The strike of the Kelly vein is about N. 45° W. and the dip southwest, from 33° to 60°.

From the Kelly drift, two cross-cuts were extended easterly each about 330 ft. in length, both of them cutting a third vein with a trend about N. 35° W. and a southwesterly dip. This third vein likewise contains grains of sulphides and vein-quartz but no commercial ore.

If we suppose that the block of ground containing the upper productive mine to have been shoved to the southwest on, say, the Yellow Dog vein, which is probably a great fault, the Kelly vein might correspond in position and trend to the hanging-wall vein and the third vein to the main or Red Cloud vein of the upper workings.

It has also been suggested that a large vein, apparently lean in ore, that exists on the surface to the east of the Red Cloud, represents one of these veins in depth. Undoubtedly more ore exists on the property, and as the expense of opening up in depth has already been incurred, it is a good gamble to make further explorations under the direction of an engineer conversant with the laws of faulting. Altogether, about 5,000 ft. of work was

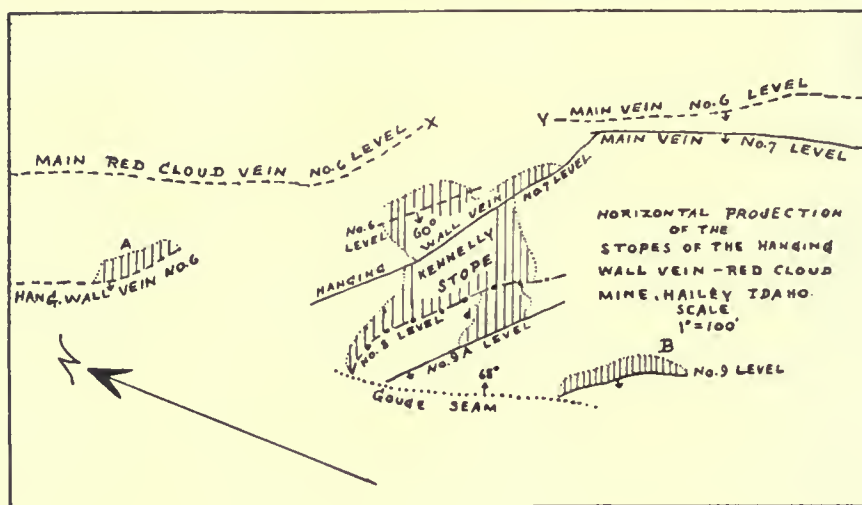


Fig. 3.

done on the lower adit-level without disclosing any ore-body.

Road Distances in Nevada.

During an automobile journey through the principal mining districts of Nevada, W. Q. Wright, Pacific Coast manager for the Wellman-Seaver-Morgan Co., ascertained the actual road distances between the prominent mining camps and towns of Nevada. The trip was made over the regular roads used by automobile stage-lines, and in order to measure each distance correctly an odometer was attached to Mr. Wright's machine. It will be interesting to those who have already traveled by stage in Nevada to note the discrepancies between the distances recorded herewith by Mr. Wright and the mileage as charged for by the motor stage companies:

Localities.	Distance Miles.
Reno to Wadsworth.....	35
Wadsworth to Hazen.....	16
Hazen to Fallon.....	18
Fallon to Rawhide.....	45
Rawhide to Fairview through Monte Cristo and Eagleville.....	42
Fairview to Wonder.....	14
Wonder to Hercules.....	1 1/2
Hercules to Cloverdale.....	94
Cloverdale to Round Mountain.....	39
Cloverdale to Duluth.....	48
Fairview to Duluth.....	46
Fairview to Fallon.....	39
Round Mountain to Manhattan by the foothill road.....	18
Manhattan to Tonopah.....	45
Tonopah to Goldfield through Diamondfield.....	29

Construction and Manipulation of a Gasoline Assay-Furnace.

Written for the MINING AND SCIENTIFIC PRESS
By WILTON E. DARROW.

While there are many fairly good combination gasoline assay-furnaces on the market, I am using a home-made one, which, in some respects, is superior to the manufactured furnaces that I have seen. I enclose a drawing and description of its construction, together with an account of the making of a control assay on sulphides as practiced at the Amador Reduction Works, at Amador, California.

The frame-work, or shell for the furnace, is made in two separate parts, marked *A* and *B*. The former is a rectangular box constructed of No. 16 sheet-steel, bound around the top with a strip of heavier metal to give it stiffness. This shell contains the melting-furnace and the fire-box, as well as the supports for the muffle.

This shell is approximately 18 by 30 in. square at the base by 11 in. in height. It contains a melting-chamber 10 by 10 in. and 9 in. deep. The waste products of combustion from this compartment pass through a 2-in. circular boss, set in a 4-in. circular flue, into the fire-box under the muffle. The top of the muffle is constructed with such an area that the muffle forms a complete cover, having about a $\frac{1}{4}$ -in. bearing all around, with the exception of two openings, $1\frac{1}{4}$ in. square, which communicate with a similar sized groove extending around the roof over the front of the muffle. This groove is constructed in the part of the shell marked *B*, which is 16 by 18 in. by 12 in. high.

In the construction of furnaces I use various compositions of material suitable to the purpose; some are refractory; some are for insulation; while others are simply to fill space in the shells. For the purpose of filling in the sides and corners of the lower compartment and the top of the muffle structure, good fine concrete is about the cheapest and best material to use.

For a top and cover of the furnace, and for insulating material between the fire-box lining and the concrete, I use the following mixture:

4 parts of old plumbago crucibles, crushed to 16 mesh.
2 " " asbestos packing.
1 " " fire-clay.
 $2\frac{1}{2}$ " " water.

The asbestos, clay, and plumbago should be well mixed by rubbing them through a coarse sieve before adding the water. This makes a spongy mass that is difficult to work into the desired shape, especially when making furnace-covers; but it is stronger and more durable than it would be if more water were used in its construction.

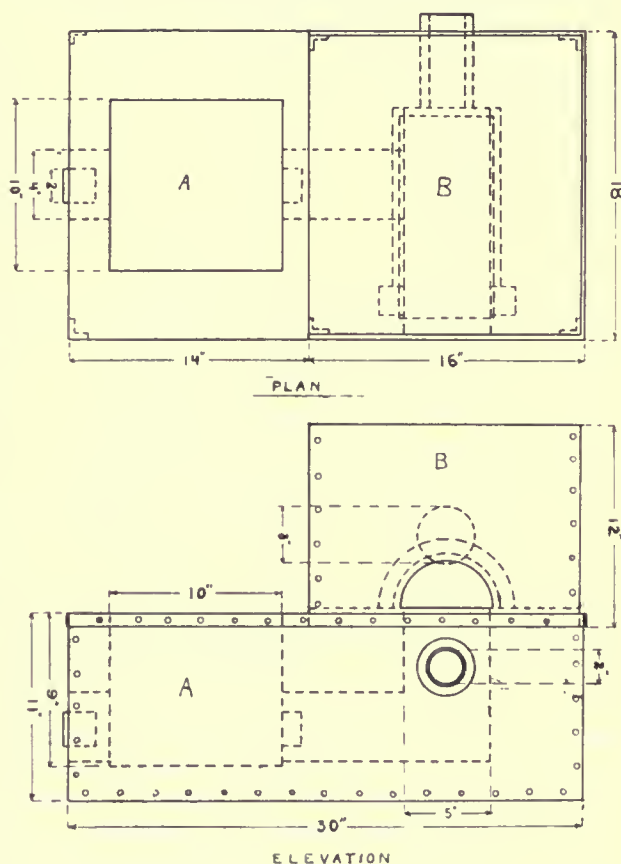
After the insulating material is in place, a mixture of 4 parts of old clay-crucibles crushed to pass 20 mesh and 1 part of fire-clay makes a good refractory lining for the fire-boxes and roof over the muffle; but it is better when given a thin finishing coat of a mixture composed of equal parts of fire-clay and old clay crucibles, crushed to pass 80 mesh, and made into a thick dough with water. I also use this mixture for constructing the bosses, and as a lining for my covers.

To construct covers I take a quantity of the plumbago mixture, then pat and rub it into the desired form on a piece of heavy paper spread over some smooth surface, where it can remain to dry and harden, after which I peel off the paper and apply a thin coating of the refractory luting, which protects the surface that is exposed to the fire from the fluxing action of the volatilized fluxes thrown off from the fusing assays. Covers made in this way are quite strong and durable; and if kept protected

from the fire, they will sometimes last for nearly a year. They are also excellent non-conductors of heat; and if one exercises a little care in their construction, they present a neat appearance, and can scarcely be distinguished from the commercial plumbago covers found in the market.

In operating the furnace, I use a couple of $1\frac{1}{4}$ -in. Cary burners, with 2-in. fire-bosses. For burners of this size F. W. Braun advises the use of bosses $2\frac{1}{2}$ in. diam., claiming that bosses of this size are necessary to keep the burners at a generating temperature; but I find that, if the discharge-flue from the fire-box is reduced to what I consider the proper size (2 in.), it burns the heads rapidly, though this can be largely remedied by facing the burners with a thin luting.

To recapitulate the important parts of the finished furnace: We have a fire-box 10 by 10 in. This will hold six 30-gm. crucibles; but I find that it works better with



only five, arranged in the form of a square, with one in the middle. The discharge from this compartment is through a 2-in. circular boss luted into a 4-in. circular flue, which enters the bottom of the fire-box. From the muffle fire-box the discharge is through two orifices placed close to the front of the muffle, one on each side. These admit the fire to the chamber above the muffle, the roof and walls of which are about $\frac{1}{4}$ in. away from the top and sides of the muffle itself. This construction throws the heat to the front of the muffle, where the cold air enters and thus equalizes the temperature so that it is under perfect control. Twenty-eight $1\frac{1}{4}$ -in. cupels can be inserted in the muffle, and if care is exercised in regulating the draft at the door, and if the heat from the burner is carefully adjusted, this number of buttons can be cupelled at once. All of them will show some feathers of litharge.

The ordinary inaccuracies and disagreements in assays can usually be traced to the four following causes:

1. Incomplete crushing and mixing of the sample.
2. Improper fluxing.
3. Bad control of the temperature during fusion.

4. Excessive temperature during cupellation. My method of preparing the samples for control assays is as follows: Starting with a large sample, I roll and quarter down in the usual way, until I have a sample of about 20 oz. remaining. This I crush to pass a 150-mesh sieve. I then mix this thoroughly by passing it several times through a 40-mesh sieve, rolling and mixing it on the cloth a few times between the siftings. The reason for so much care in sifting and rolling the crushed sample is that, when a high-grade concentrate is given, the first preliminary sifting on a fine sieve preparatory to crushing it throws the sample into two distinct grades of valuable material; besides the portion that is finally crushed to pass the fine sieve has a tendency to roll up in little balls on a sample-cloth, so that the sifting is necessary to get a perfect admixture of the first-crushed and last-crushed portions of the sample.

Our sample is then quartered and sealed in four packages, two going to the seller, one for assay, and the other is for the umpire in case of disagreement.

For the assay I take four $\frac{1}{2}$ A. T. charges of the ore. These I flux as follows:

	Grams.
Ore $\frac{1}{2}$ A. T., or.....	14.58
Litharge.....	70
Sodium bicarbonate.....	30
Borax.....	8
Silica.....	10
Nitre.....	22 to 25

This I charge into a 20-gram crucible, and cover with 10 grams of borax. Many assayers lay a great deal of stress on the exact quantity and kind of fluxes to be used in making up an assay charge; but I believe that on ordinary ores, any flux that yields a soft button of the right size, and carries an excess of litharge, with a fluid slag, will yield correct assays, if the other conditions are perfect. Of course there are exceptional cases, such as rich copper, or telluride ores, or ores that contain some element that carries all of the gold into the cupel (probably as an alloy similar to a case that came under my observation at the Golden Gate mine, of which I wrote in the MINING AND SCIENTIFIC PRESS under the title of 'Sampling and Assaying' in April last). Now, having the four assay-charges ready for fusion, and supposing that I have no other assay to make, I place an old slag-coated crucible in the middle, with the four control assays ranged around in the furnace, and start the gasoline fire, using from 15 to 20 lb. pressure. As soon as the burner is sufficiently heated to generate gas, I start the fire in the furnace, turning on a strong blast for about ten minutes; this starts the borax covers to melting. By this time the charges commence to simmer, and I reduce the supply of gasoline down to a quantity that will barely allow the fluxes to act on the ore; so that the action goes on without any boiling or spitting, and the charges slowly settle down in the crucibles in quiet fusion. This takes about half an hour. I now increase the supply of gasoline to render the crucibles hot and the slag fluid. Were the assays to be poured now, the results would be a little low, as some of the ore is left adhering to the sides of the crucibles, and the slag probably contains particles of ore that were not reduced before the lead was mostly precipitated. This warming will require probably about five minutes. I now turn on a quantity of gasoline in excess of the combustion-capacity of the furnace, owing to the restricted discharge-orifice, which is a 2-in. boss. This produces a reducing action and a slightly lower temperature. This action I allow for about ten minutes, when the surfaces of the assays and all exposed slag-surfaces will be covered with particles of lead that have been reduced from the excess litharge combining with the smoke from the unburned carbon in the gasoline. This shower of lead washes down all of the gold that was

left adhering to the sides of the crucibles, and, passing through the slag, it will collect nearly all of the gold that has a tendency to remain in the slag—usually attributed to 'slag absorption.' The supply of gasoline then being reduced to a point that gives complete combustion for about ten or fifteen minutes, the crucibles become thoroughly heated, and the lead is collected into one button. The assays are then poured. The empty slag-covered crucible will be found to contain a little shot of lead that was reduced from the adhering slag. If now there are no more fusions to be made, the old crucible makes an excellent plug to put into the discharge flue on the inside of the melting furnace, to confine the heat while the muffle furnace is in use. I can run both furnaces at the same time, if desirable; but find that my time is usually fully occupied in preparing other assays, and pounding and cleaning the buttons for cupellation.

A few years ago it was generally supposed that there was no appreciable loss in cupelling gold ores, and that the cupellations could be safely made with a high temperature in the muffle. This has, however, been disproved by many careful assayers. I have made many tests in this office in recent years, and find that there is a loss of about 2% of the gold if the cupellations are run at a high temperature.

The Prospector.

Enquiries sent to this department are answered free of charge, if submitted by subscribers who are not in arrears. The full name and post-office address of the sender must be given, otherwise no answer will be made. Those who are not subscribers must accompany their questions with a fee of \$3 for each question. No assays are made.

A piece of decomposed granitic rock with blackish spots due to iron was sent by B. M. C., of Wonder, Oregon.

Specimens from Orleans, Cal., marked W. B., are: No. 1, Quartzite; No. 2, metamorphosed Diabase; No. 3, Diabase.

The rocks from Paris, Cal., marked E. F. E., are: No. 1, 2, and 5, Quartzite; No. 3, Granite Porphyry; No. 4, Rhyolite.

The two rock specimens from Seven Troughs, Nev., marked R. L. B., are: No. 1, Rhyolite; No. 2, altered Rhyolite.

The rocks from Homestead, Ore., marked F. E. P., are: No. 1, Serpentine and Chlorite with Pyrite; No. 2, Serpentine.

B. F. M., of Lander, Nev., sends: No. 1, Rhyolite; No. 2, weathered Rhyolite; No. 3, Andesite; No. 4, specular Hematite.

E. C. B., of Los Angeles, sends: No. 1, Galena, Chalcopyrite, Malachite, and Azurite; No. 2, earthy Hematite and Limonite.

The minerals received from J. L. H., of Isabelle, Cal., are: No. 1, Limonite; No. 2, Chalcopyrite and Bornite in quartz; No. 3, Magnetite and Pyrrhotite.

D. R. N., of Nelson, Nev., sends: No. 1, specular Hematite in quartz; No. 2, Fluorite; No. 3, Chrysotile Asbestos, Serpentine, and Quartz; No. 4, Epidote; No. 5, Calcite.

MOORE filter-baskets are used at the Waihi mill in New Zealand, not only for filtering cyanide solutions, but also for the purpose of merely thickening the slime-pulp before it is cyanided, there being a separate installation for that purpose.

The Roasting of Telluride Ores.

Contributed to the MINING AND SCIENTIFIC PRESS
By R. L. MACK and G. H. SCHIBB.*
With an Introduction by T. T. READ.

INTRODUCTION.

Telluride gold ores were first discovered in 1782, near Nagyag, in the historic goldfield of Transylvania, by a Hungarian peasant. From the first specimens Klaproth, sixteen years later, separated a new element, which he named tellurium. Similar ores were shortly afterward discovered near Offenbanya, also in Transylvania. Tellurides of various metals were discovered from time to time in different parts of the world, but the next discovery of importance from a mining standpoint was in 1871, when tellurides of gold and silver were found in Boulder county, Colorado. These were extensively exploited, and until the deposits at Cripple Creek in Teller county were uncovered in 1891, Boulder remained the chief locality for such ores in the United States. Soon afterward (in 1893) rich deposits of telluride gold ore were discovered at Kalgoorlie in Western Australia. Cripple Creek and Kalgoorlie entirely overshadow all the other telluride districts and are among the chief producers of gold, Cripple Creek furnishing \$15,500,000 of the \$58,000,000 of gold produced in the United States during 1905, while the production of Kalgoorlie was approximately one-quarter of the total production of \$56,000,000 credited to Australasia.

There are some twenty-six minerals that contain tellurium, but of these not all are recognized as well-established species. Five are tellurides of gold and silver, namely, calaverite, $(\text{AuAg})\text{Te}_2$ (Au 40%); sylvanite, $(\text{AuAg})\text{Te}_2$ (Au 25%); Krennerite, $(\text{AuAg})\text{Te}_2$ (Au 36%); petzite, $(\text{AuAg})_2\text{Te}$ (Au 26%); Hesseite, Ag_2Te (Ag 63%); and one, nagyagite, is a sulphotelluride of lead and gold (Au 7.5%). Recently Lenher has questioned whether the tellurides of gold and silver in nature are true compounds, since they will precipitate gold from its chloride solution². So many compounds, (galena, for example) have the power to reduce gold from its solutions that this argument does not seem entirely convincing. But the wide variation in composition of sylvanite and calaverite, which have the same chemical formula, lends color to the hypothesis that these minerals are essentially alloys of gold, silver, and tellurium, which by some unknown factor in the deposition of the ores, have been formed in approximately atomic proportions.

The difficulties presented in the metallurgical treatment of telluride ores were early recognized and have remained a subject of study to the present. The essential features of the problem are easily grasped. The telluride ores are all extremely brittle as well as extremely valuable; for this reason any ore-dressing method is entirely out of the question, as the losses in slime would be prohibitive. Direct smelting alone is also out of the question, as the ores do not contain lead or copper to serve as collectors of the precious metals, and, in the case of the Cripple Creek product, they carry so much alumina that they can only be slagged by mixing with other ore. In the case of the high-grade ores, which can bear the freight and treatment charges, it is possible to recover the precious metals in the dry way, by mixing them with leady ores in suitable proportions. In this way, there has grown up the custom of screening the ore at the mines; the lump ore is washed, sorted, and sent to the chlorination

or cyanide mills for treatment, the fine screening, which is much richer, ranging in value from forty to several hundred dollars per ton (due to the brittleness of the valuable mineral, and the tendency of the ore to break finer where it is most rich), is shipped to the smelters. Naturally the handling of large quantities of fine in the blast-furnace presents much difficulty and makes briquetting necessary. More recently it has been found by experiment that in the Huntington-Heberlein process for the desulphurization of lead ore, the Cripple Creek fine can be used instead of lime to keep the charge from fusing too easily, and with equal success. In this way a large percentage of fine is handled cheaply and conveniently.

But the cost of smelting makes some other method of treatment necessary for the ores of lower grade. It would be unprofitable to attempt to rehearse all the processes that have been tried and abandoned. Naturally, amalgamation was early tried on the oxidized ore of the upper portion of the veins, for although the tellurides themselves are not wetted by mercury and, consequently, are not amalgamable, yet in the oxidized portion of the veins the mineral has generally lost its tellurium, leaving the gold in a spongy brownish form, known as 'mustard' gold. But this gold is not in a state suitable for amalgamation, partly because of its spongy nature, and partly because its surface is not clean and bright, allowing ready wetting by the mercury. Leibius decided that the 'rustiness' was due to a coating of iron oxide on the gold; and other writers have ascribed it to a coating of the tellurite of iron (a mineral described by Knight³ which has no mineralogical name, and is doubtful as a mineralogical species). It seems most probable that it is chiefly due to the physical state of the gold, as gold precipitated from solution in a spongy form is not readily wetted by mercury, a fact which Henry Louis has ascribed to the existence of gold in a dimorphous form.

Of the various wet methods, only two, chlorination and cyanidation, have met with any degree of success. Cyanidation was early tried on the oxidized ore, but because the process had not then reached as advanced a state of development as at present, the results were not usually successful. Many difficulties were encountered, of which probably the chief were the mechanical ones of leaching the finely ground ore and filtering the solutions. The unoxidized ore is not amenable to cyanidation, as the telluride is not readily attacked by cyanide solution. The treatment of the ores by chlorination involves a preliminary 'dead' or 'sweet' roast to eliminate all reducing substances, which would otherwise consume chlorine. The advantages and disadvantages of the chlorination process for Cripple Creek ore have been discussed at length by Greenawalt and Argall in a series of papers published in Vol. 78 of *The Engineering and Mining Journal*. Until recently the chlorination process has been regarded with more favor than the cyanide process. But since the chlorination process costs for extraction approximately \$3.50 per ton on average ores, and only gives a yield of 95% of the gold and none of the silver contained (which gives a tailing richer than \$1 per ton on average ores), there has naturally arisen a demand for a cheaper process which shall give a greater extraction. Temporarily the chlorination process is supplemented by concentrating the tailing from the chlorination barrels on Wilfley tables, the concentrate being shipped to the smelters, while the tailing from the tables is cyanided by decantation.

The application of the cyanide process to the unoxi-

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¹ The Telluride Ores of Cripple Creek and Kalgoorlie. T. A. Rickard. *Trans. A. I. M. E.*, Vol. XXX, pp. 708-718.

² Lenher. Naturally Occurring Telluride of Gold. *Jour. Amer. Chem. Soc.*, Vol. 21, p. 355.

³ *Proc. Colo. Sci. Soc.*, Vol. V, p. 66 (1894).

dized ores has been chiefly worked out by Australian metallurgists. Development has progressed along three principal lines, namely, (1) fine grinding, roasting in Merton or Edwards furnaces, and cyanidation by leaching, decantation, filter-pressing, or combinations of these; (2) rather coarse grinding, roasting, amalgamation in pans or on plates, and cyaniding the tailing; (3) concentration on tables to extract the sulphides (which are roasted and cyanided), followed by extraction of the gold from the unroasted tailing by means of cyanogen bromide. The difficulty in roasting and cyaniding direct is that the telluride mineral exists in the ore in rather coarse particles, which melt at the beginning of the roast into globules that afterward become, by the loss of their tellurium, pellets of gold, which are not entirely dissolved during any reasonable length or exposure to the action of the cyanide solution. The West Australian ore also contains some free gold, which adds to this difficulty. This has been taken advantage of in the process of Sutherland and Marriner, who advocate crushing rather coarsely, conducting the roast in such a manner as to yield a maximum of the gold pellets, and then amalgamating these in pans and on plates. The chief objection to this method is the difficulty of preventing the escape of mercury into the tailing from the plates. The third method, known as the Sulman-Teed process, in which the values are extracted directly from the unroasted ore by the use of cyanogen bromide, is entirely successful, but on West Australian ores shows no advantage in cheapened cost or greater extraction. It seems highly probable, however, that if properly modified to meet the slightly different features of Cripple Creek ores, it could be applied to them at a less cost and with more satisfactory results than either of the other processes.

The roasting of telluride ores preparatory to cyanidation presents several unusual features. The roast is ordinarily controlled by determining the elimination of the sulphur. But the sulphur is essentially not concerned in the roasting, as the amount of sulphides present in these ores would not ordinarily affect their cyanidation, the real problem being to free the gold from tellurium in order that it may become soluble in the cyanide solution. Once begun, however, the combustion of the sulphur must be carried to completion to break up the sulphates at first formed. It is arbitrarily assumed that a roast which is satisfactory from the standpoint of the sulphur, has also satisfactorily eliminated the tellurium, but direct proof of this is entirely lacking. It is not even known whether the tellurium is driven out in the roasting of these ores. Richard Pearce⁴ has shown from experiments that the tellurium may be almost entirely changed to TeO₂ and retained in the ore, probably as a tellurite, but that the presence of pyrite causes it to be driven off to a much greater extent. He also found that tellurium may be sublimed directly in the roasting furnace, as crystals of it have been found to occur there. There remains, therefore, considerable doubt as to the behavior of the tellurium beyond that the gold is freed of it in a properly conducted roast.

In freeing the gold of tellurium, certain losses are known to occur. These may be due to (1) a mechanical loss in dusting from the driving out of the moisture and gases of the ore, (2) a mechanical loss from the driving off of tellurium from the gold, (3) a loss by actual volatilization of the gold. F. C. Smith⁵ found an average loss of 11.45% of their gold contents on roasting various samples of the Potsdam ores of the Black Hills for one hour. The method of conducting the roast is not described. It is well known that no such losses as these

ordinarily occur in roasting Cripple Creek ores. It seemed wise, therefore, to undertake to investigate what the losses in roasting actually are, and how they are affected by various physical conditions.

EXPERIMENTS IN THE ROASTING OF TELLURIDE ORES.

The object of this investigation was to find:

1. The effect of the size to which the ore is crushed before roasting upon the degree of desulphurization attainable and upon the loss of gold.
2. The effect of the temperature at which the roast is conducted upon the desulphurization and loss of gold.
3. The amount of gold lost during roasting.
4. The relative distribution of the gold in the various sizes of crushed ore.

The ore upon which the tests were made was a lot of about 300 lb. obtained from the Portland mine, which is situated on Battle Mtn., in the Cripple Creek district, Colorado. It is representative of the ore of that mine, as described on page 442 of Professional Paper No. 54, issued by the U. S. Geological Survey on the 'Geology and Gold Deposits of the Cripple Creek District.'

"All the unoxidized ores are alike in owing their value to the presence of a telluride of gold which seems to be almost invariably calaverite, although the occurrence of sylvanite has been reported by Rickard. This telluride is rarely found in well formed crystals and is frequently present in particles so minute as to be invisible to the naked eye. The ore most typical of this mine is that occurring in breccia, which is fine grained and gray, made up of barely recognizable fragments of phonolite and andesite and locally blocks of granite sometimes as much as from one to six feet in diameter. Finely disseminated through it are much finely divided pyrite and considerable scattered carbonate. The calaverite occurs in very narrow fissures or joints in this breccia, associated with crystalline films of dolomite, with sometimes a little silica and fluorite. In most cases the ore shows very little calaverite to the naked eye. The value of the ore appears to lie wholly within these narrow joints. The fine pyrite impregnating the breccia is not known to be auriferous."

The following table shows a comparison between analyses made by the U. S. Geological Survey on Portland ore and that made by us. The Survey analysis was made on "Normal ore from the Portland mine, largely from breccia, country rock, and slightly oxidized."⁶ The object in making this analysis was to find out if any great variation existed between our lot of ore and that experimented on by the Survey:

	U. S. G. S.		C. C.
SiO ₂	54.91	54.68	53.3
Al ₂ O ₃	17.80	17.87	16.8
FeO.....	4.80	5.30	4.14
MgO.....	0.36	0.20	Not determined
CaO.....	2.04	2.65	3.08
Alk.....	12.00	12.00	Not determined
MnO ₂	0.66	0.94	"
S.....	2.49	2.25	3.08

The ore upon which our tests were made was taken from a hopper just before going to the roasters at the Portland mill. It had been broken by Blake crushers, followed by rolls, and all had passed through a 14-mesh screen. The following table shows the results of a screening test and the percentage of gold in the various sizes. A comparison is also shown between the screens used for this test and those recommended by the Institution of Mining and Metallurgy. The dimensions of the wires and apertures of the screens were obtained by means of a microscope having a micrometer eye-piece, the results being the average of a large number of readings. The nest of screens used, of the meshes shown, were of the usual 8-inch heavy tin-plate, brass gauze, as obtained from the Denver Fire Clay Company:

⁴ *Proc. Colo. Sci. Soc.* Vol. V, p. 144 (1895).

⁵ *Trans. Amer. Inst. Min. Eng.* Vol. XXXI, p. 1 (1896).

⁶ 'Geology and Gold Deposits of the Cripple Creek District,' p. 172.

Mesh	C. C. screens. Aperture, Inch.	Committee. Screen ap- erture, Inch.	Wire, diam. Inch.	Gold, Oz. per ton	Size of gold, \$.	Ore retained on screen, %	Size, \$
20	0.0086	0.015	49.0	0.023	1.40	7.56	2.61
40	0.0162	0.0092	41.0	0.0132	0.96	23.75	2.47
60	0.0096	0.0074	32.5	0.0082	1.37	17.17	2.62
80	0.0075	0.0051	35.4	0.0065	1.55	8.72	8.01
100	0.0055	0.0047	29.6	0.0056	1.22	4.54	4.87
120	0.0043	0.0042	25.6	0.0044	1.56	8.08	6.78
150	0.0038	0.0029	31.7	0.0039	1.57	4.05	3.38
Through 150					1.53	25.38	21.03
							3.93

The screening test was performed by placing 100 grains of the crushed ore upon the coarsest of the nested screens and replacing the cover. The nest of screens was then inclined at an angle of 30° and the ore made to pass across the screens by jarring them with a heavy spatula. When it had all been brought to the lower side, the screens were again tilted to bring this side uppermost, and the ore made to pass back again. This process was continued until it was judged that no more material was passing through. The top screen was then removed, the material retained on it weighed, and the jarring process continued some time longer on the next screen. In this way the finest screens received, as is necessary, more jarring, and the comparative uniformity of the results thus obtained indicate the accuracy of this method of performing the screening assay. Five trials are recorded:

WEIGHT RETAINED.						
MESH.	1	2	3	4	5	Average.
	%	%	%	%	%	%
On 20	7.2	7.27	6.9	6.6	7.4	7.07
" 40	30.87	32.18	32.4	31.8	31.2	32.39
" 60	17.32	16.05	16.4	16.1	16.2	16.41
" 80	7.12	8.53	8.2	8.4	7.8	8.01
" 100	4.76	4.28	5.3	5.2	4.8	4.87
" 120	6.49	5.92	8.1	7.1	6.3	6.78
" 150	3.56	3.66	3.0	3.6	3.1	3.38
Through 150	22.41	22.17	19.1	21.7	19.8	21.03
Total	99.83	100.06	99.4	100.5	99.6	99.64

The amounts retained on the various screens were then sampled, crushed on a bucking board to pass 100 mesh, and assayed, the following charge being used:

One-half assay-ton of ore; 1 of lead flux; $\frac{1}{2}$ of Na_2CO_3 ; and 1 assay-ton of PbO . Then a borax cover.

The lead flux was composed of 16 parts, K_2CO_3 ; 16 of Na_2CO_3 ; 8 of flour; and 4 of borax.

The sulphur in each size was also determined, the following method being used: Treat one gram of ore with $\frac{1}{2}$ gm. KClO_3 and 7 cc. HNO_3 conc., adding 3 cc. of the acid first and letting this boil to fumes of NO_2 and then adding 1 cc. at a time, the final volume of the acid present being about 2 cc. When the flask was removed from the heat, diluted with 50 cc. H_2O and an excess of Na_2CO_3 added to precipitate Fe, etc. The solution was then boiled 30 to 60 min., the bulk being kept constant. It was then filtered and the precipitate washed until it was free from all traces of H_2SO_4 . The filtrate thus obtained was acidified with HCl and boiled until all the CO_2 was expelled, when the SO_3 was precipitated with BaCl_2 and weighed as BaSO_4 after ignition. As is seen from the above table, a slight increase of gold is found in the fine. This is due to the fact that the gold minerals occur in the cleavage planes of the ore. When broken, it yields along the cleavage, since this affords lines of weakness, thus exposing the tellurides, which are scraped off and become concentrated in the fine. This difference is more marked between the lump ore and the fine screening than is the case with such fine ore as was used in the above tests, because this ore already consists of fine material and

hence the opportunity for concentration is not so great. The increase of sulphur in the fine as shown by the above table is due to the fact that the pyrite disseminated in the ore being brittle is easily broken and worn away, and hence concentrates in the fine material.

ROASTING.—The necessity for the roasting of tellurides preparatory to cyaniding is due to the insolubility of tellurides in cyanide solutions. Crooks says: "Tellurium not only refuses to form a telluro-cyanide when fused with potassium cyanide, but takes the place of the cyanogen therein, forming potassium telluride, which is speedily decomposed by the action of the air, into potash and metallic tellurium."

There is no action between the cyanogen radical and tellurium, but the alkali in presence of oxygen invariably dissolves some of the metal, forming a solution which has a reducing action. When a telluride ore is roasted it leaves a residue containing TeO_2 , and this oxide is very soluble in KOH , forming a tellurite, which also acts as a reducing agent and absorbs oxygen from the solution. The same change takes place with KCN with an evolution of HCN . Roasted tellurides are, however, capable of being treated, and the gold extracted with good results.⁸ It is said that when an ore has been roasted sufficiently to be ready for chlorination it is also in a suitable condition for cyaniding; the reverse, however, is not always true. The aim of roasting telluride ores before cyaniding is to leave the ore in such a condition that there shall be no deoxidizing agents or cyanicides present. The effect of cyanicides is simply to use up the cyanide in the solution, while the deoxidizing agents prevent the dissolution of the gold in a reasonable time. The objects of roasting are:⁹ 1. To convert the base metals into insoluble compounds, or into compounds which, if soluble, do not act as reducing agents in the solution. 2. To form soluble compounds which do not decompose the KCN solution. 3. To liberate all the particles of gold and silver from any encasing matter. As it is not practicable to determine tellurium in the ordinary operations of the works, it is assumed that when the sulphur is well burned off that the tellurium is also burned off, or volatilized. This assumed close relation between the actions of sulphur and tellurium does not seem to hold exactly for all ranges of temperature. The sulphur in telluride ores occurs almost entirely as FeS_2 (iron pyrite). The process of burning off the tellurium consists of four distinct changes, as follows:

1. $\text{FeS}_2 = \text{FeS} + \text{S}$. One atom of the S is rather loosely held and is driven off at a rather low temperature—350° C (598° F).

2. $3\text{FeS} + 11\text{O} = \text{Fe}_2\text{O}_3 + \text{FeSO}_4 + 2\text{SO}_2$.¹⁰

The last reaction and the one most difficult to effect occurs at a temperature of about 695° C (1,283° F) when the sulphate is decomposed as follows:

3. $2\text{FeSO}_4 = \text{Fe}_2\text{O}_3 + \text{SO}_3 + \text{SO}_2$.¹¹

If the temperature at the completion of the roast is not around 700° C (1,290° F), FeSO_4 will be left in the ore, which dissolves cyanide and robs the solution of its free oxygen. On the other hand, the temperature must be low at the start of the roast or some of the base metals and tellurides may fuse and form (with the iron pyrite) a matte, which encases the gold, destroys the effects of previous fine grinding, and prevents the solution from dissolving the gold in a reasonable length of time.

A telluride ore crushed to go through a 14-mesh screen and containing 3 to 4% sulphur, if heated to a temperature around 1,095° C or 2,000° F, will be highly fritted.

⁷ Select Methods in Chemical Analysis, p. 422.

⁸ Julian & Smart: 'Cyaniding of Gold and Silver Ores,' p. 114.

⁹ Julian & Smart: 'Cyaniding of Gold and Silver Ores,' p. 434.

¹⁰ Austin: 'Metallurgy of the Common Metals,' p. 62.

¹¹ Hofman: 'Metallurgy of Lead.'

[†]An assay-ton equals 29.166 oz. Troy.

This is shown from tests made by us, the temperatures being determined by the Fery pyrometer (Test No. 3). The same test also showed that the temperature best adapted for driving off sulphur is obtained by slowly heating the ore, with an excess of air, up to 830° C (1,526° F) and also that the sulphur may (in the case of Cripple Creek tellurides) be properly burned off at a temperature considerably below the fritting point of the ore.

If a high-grade coarsely crushed telluride is roasted, a condition may result known as shotting of the gold. It is due to the fact that the telluride melts at a comparatively low temperature and forms globules, which, on roasting, lose their tellurium, leaving the gold at the end of the roast in the form of shot, which are very slowly attacked by cyanide solutions. In order to determine the temperature at which shotting occurs, the following tests were made: A copper Constantin thermo-couple was connected to a galvanometer. The junction was arranged so as to lie flat on a piece of mica, under which a wire gauze served to distribute the heat evenly. Small pieces of calaverite, the most common telluride of the Cripple Creek district,¹² were placed beside the junction and a Bunsen burner used to heat them both. By noting when the tellurium melted down, as was easily detected by the eye, the temperature required to effect this was read directly on the galvanometer. A series of these readings showed conclusively that the temperature required to melt this particular telluride is about 365° C (689 F). If calaverite is further heated the tellurium is volatilized and burns with a green flame. By the use of practically the same apparatus as in the previous test, it was found that the point at which tellurium begins to be driven off is 550° to 575° C (1,031° to 1,057° F) and that the tellurium continues to be volatilized until the melting point of gold is reached (1,064° C to 1,947° F). It was found that the smaller the amount of tellurium with the gold, the higher the temperature required to drive it off. This is due to the fact that the last part of the tellurium is mechanically held in the globules of gold. However, as would be expected, the amount of tellurium left with the gold after the sulphur has been well eliminated, varies directly as the fineness of the crushing, being least with fine crushing.

(TO BE CONTINUED.)

SULPHURIC ACID FROM PYRITE.—In Great Britain sulphuric acid is made almost entirely from pyrites imported from Spain. Brimstone is used less and less every year and is reserved for the manufacture of acid for very special purposes. Sulphureted hydrogen, derived from the waste gases of sulphate of ammonia manufacture, has been applied extensively during recent years, and is an important source of supply of sulphur. British producers of sulphuric acid complain of the increasing difficulty in obtaining pyrite free from, or low in, arsenic, and several new plants for de-arsenication have had to be erected. The process now used by the United Alkali Co. for removing arsenic produces it as pure arsenious acid instead of the mixed mud of arsenious sulphide, as formerly. It is interesting to note that in the midland counties of England 'coal brasses' from the coal mines are used as a source of sulphur at the sulphuric acid works.—*The Chemical Engineer.*

MERCHANT TONNAGE OF THE WORLD.—According to statistics just published by *Lloyd's Register*, the merchant fleets of the globe now total 39,438,000 tons, or nearly 2,000,000 more than a year ago. Of this huge total no less than 33,969,000 tons represent steam shipping, and 17,001,000 tons of it is under the British flag.

¹²Professional Paper No. 54, U. S. Geol. Sur., p. 442.

Decisions Relating to Mining.

Specially reported for the MINING AND SCIENTIFIC PRESS.

Where a miner had himself tunneled out the room and after part of the roof had fallen, had himself placed a bar at such place in a workman-like manner, sufficient to render the roof reasonably safe, such miner had the option to do his own timbering for pay, or to have the company's timberman do the work. It appeared also that the foreman had regularly inspected the room, and had found it free from signs of weakness on the day before the accident. Under such circumstances, it was held that the company was not negligent and not liable for the death of the miner caused by falling of the roof.

Brunson v. Southwestern Co., (Ind. Ter.) 104 Southwestern, 593, Sept., '07.

A lessee was not entitled to take advantage of a condition in the lease where it provided that royalty should not be collected where the production or shipping of coal was prevented by the destruction of breakers, where it was shown that one breaker was destroyed by fire, but the remaining breakers were sufficient to prevent interruption to the mining and shipping of the coal.

Everhart v. Lehigh Coal Co., (Pa.) 67 Atl. 618, May, '07.

As between two lessees of different portions of a mine, each must know that the only use to which the ground can be put is mining; and the landlord is not liable for the willful or negligent acts of the tenant of the upper level and was not required to take active measures to prevent the caving of the ground of the upper level to the injury of the tenant and lessee of the lower level. In such case, it is the duty of the tenant or lessee to require from the mine owner such reasonable stipulations as will protect him. In order to hold the mine owner liable in such case, it must appear that he made the lease to the lessee of the upper level after leasing the lower, and that the actual situation was then such that no other result could have followed from working the upper ground but material injury to the lower, and that such state of affairs was known to the mine owner when the upper ground was leased.

Peterson v. Bullion-Beck Co., (Utah) 91 Pac. 1095, Sept. '07.

The law does not presume, merely because one tract of ground is above the other, that the working of the upper will injure the lower; the lessee of the lower level is bound to protect his own rights in making a contract against the operations of one above him, if the situation is such as to require it, rather than to rely upon a supposed duty of the lessor or mine owner, to protect him at all hazards.

Peterson v. Bullion-Beck Co., (Utah) 91 Pac. 1095, Sept. '07.

Where, in an action under the statute providing that an adverse action must be commenced within 30 days after the filing of the adverse claim, the complaint was filed within the 30 days, and the filing by the defendant of a general demurrer after the 30 days was held to be a waiver of the issuance of summons under the Practice Code providing that, after the filing of the complaint, a defendant may appear, whether the summons has been issued, etc., and that this had the effect of the issuance of summons on the day the complaint was filed, and conferred on the court jurisdiction of the subject matter and the parties.

Harris v. Helena Min. Co., (Nev.) 92 Pac. 1, Oct. '07.

Where a miner was burned in an explosion because the owner failed to comply with a statutory requirement, he was entitled to recover for permanent disability and inability to earn a living, for his pain and suffering, and also for the humiliation of being handicapped through life by distorted features and body.

Bolen-Darnall Co. v. Williams, (Ind. Ter.) 104 Southwestern 867, Sept. '07.

Lifting Magnets.

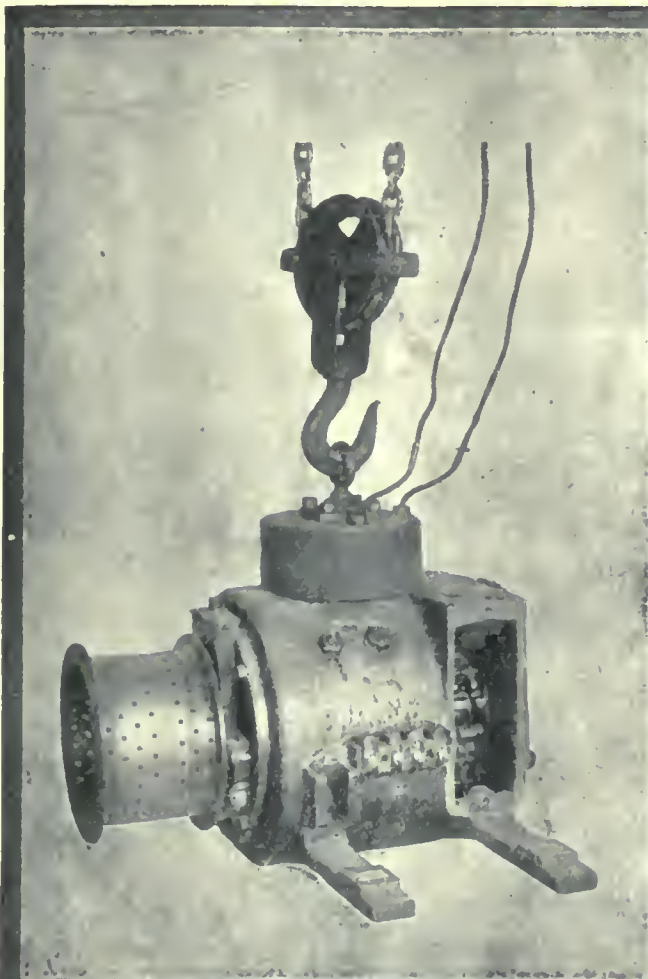
Wherever pig iron, metal plates, tubes, rails, beams, scrap or heavy castings of iron or steel are handled, lifting magnets can be advantageously employed. The time saved due to the fact that hoisting tackle need not be adjusted to the object to be raised is of itself often sufficient to justify the purchase of a lifting magnet. For handling pig iron, scrap, and similar material a further advantage is found in the fact that the objects to be moved need not be piled beforehand. All that is necessary in work of this sort is to lower the magnet onto the pigs or scrap, switch on the current—and lift. In foundries, blast-furnaces, and rolling mills magnets are useful for lifting and transporting metal too hot to be touched with the hand.

Castings which, because of their shape or because of une-

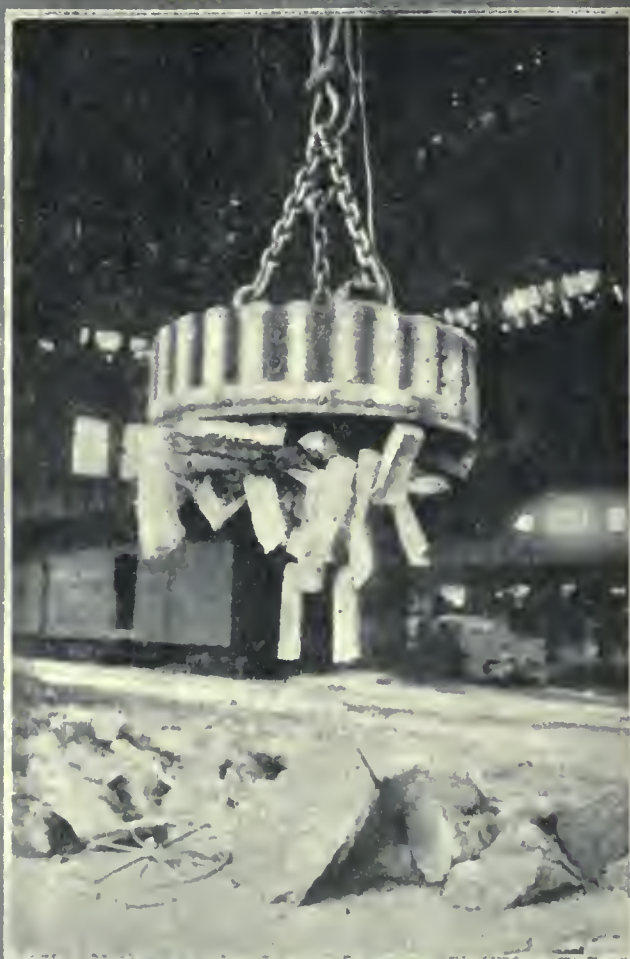
have been picked up from a wooden car or from the ground.

At the tests conducted at the Carnegie Steel Co.'s Works a 50-in. Cutler-Hammer magnet lifted from the ground 32 sand-cast manganese iron pigs averaging 65 lb. each in weight—a total lift of 2,080 lb. During the same test this magnet readily picked up a steel 'skull' weighing 5,500 lb., this in spite of the fact that the surface presented to the magnet was very uneven and extremely dirty, being almost covered with slag at the point where magnetic contact was made. Under fair average conditions a 50-in. magnet should handle from 1,000 to 3,000 lb. of material at a time, but this may fall to 500 lb. under adverse conditions, or rise to 10,000 lb., or even 20,000 lb., under conditions extremely favorable.

Every prospective purchaser of a lifting magnet naturally wants to know the amount of current consumed, so as to intelligently calculate the saving that may be reasonably



10-Inch Magnet Lifting 800 Lb.



A Ton at a Time.

qual distribution of weight, require careful adjustment of hoisting tackle, and finished parts which would be liable to be chafed with chains, are examples of objects which can be more conveniently handled with lifting magnets than in any other way. Armor plate and thin sheets of iron or steel used in the manufacture of pressed steel or iron ware, car wheels, and a multitude of other finished or raw products forming part of the metal industry are all capable of being expeditiously and economically handled with lifting magnets.

Perhaps the question most frequently asked concerning a lifting magnet is: How much will it lift? This depends on the nature of material handled. Given a solid mass of steel or iron, a 50-in. Cutler-Hammer magnet will lift as much as 20,000 lb. Under adverse conditions the lifting capacity of the same magnet might drop to 1,000 lb. or less. In the test at the works of the Youngstown Sheet & Tube Co. adverse conditions were present, owing to the fact that the pig iron had to be lifted from a steel gondola. The average lift (755 lb.) would have been greater if the pigs could

be expected in handling material with this labor-saving device. The following figures, obtained during the test of a 50-in. Cutler-Hammer magnet at the plant of the Youngstown Sheet & Tube Co., throw light on this point:

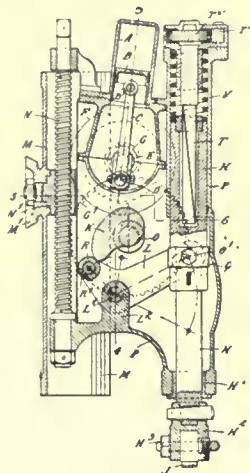
Total weight of pig iron unloaded from steel gondola.....	109,350 lb.
Weight of average lift (including 'lean' lifts when cleaning up car).....	785 lb.
Trips required to empty gondola.....	139
Current on magnet.....	1 hr. 15 min.
Current off magnet.....	50 min.
Time consumed in unloading gondola.....	2 hr. 5 min.
Current required to energize magnet.....	30 amperes at 220 volts.

From the foregoing figures the cost of operation is easily calculated, assuming cost of current to be 3 cents per kilowatt hour, which is much in excess of actual cost of current in large industrial plants. Thirty amperes at 220 volts corresponds to a power consumption of 6,600 watts, which was required for 1 hr. and 15 min. This gives a total power consumption of 8.25 kw. hr., which at 3 cents per kw. hr. gives a total of a little less than 25 cents—cost of current for energizing magnet during the period required to unload 54 tons of pig iron.

MINING AND METALLURGICAL PATENTS.

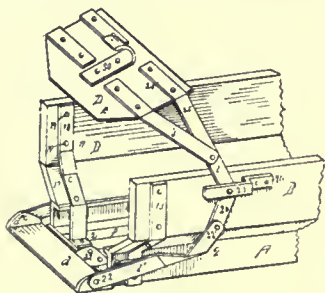
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ROCK-DRILL AND OTHER PERCUSSION TOOL.—No. 870,653; Thomas Warsop, Coniston, England.



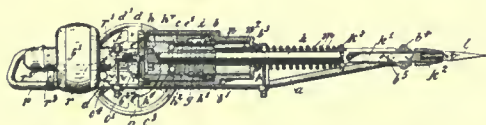
The combination in a percussion tool, of a petrol motor, a shaft driven by said motor, a second shaft geared to the first shaft, a cam on said second shaft, a tool carrying spindle, a pair of bell crank levers pivoted intermediate their ends, the outer ends of said bell crank levers being connected to said spindle, a cam roller mounted between the inner ends of said bell crank levers and in the path of said cam, whereby said cam will move said spindle in one direction, and a spring for moving the spindle in the other direction.

MINE-CAR.—No. 870,542; Eugene C. Callahan and Frank L. Callahan, Terre Haute, Indiana.



In a mine-car the combination of a metallic frame constructed of channel and angle iron parts and provided with open clips adapted to engage the standards of the side-boards, draw-bars at each end, axle sleeves, axles and traction wheels, with a bed consisting of hopper-like side-boards, provided with standards adapted to brace the sides and to engage clips provided upon the sides of the metallic frame, a rear end-gate attached to the side-boards, an automatic front end-gate attached to the front ends of the frame and bed, by means of a system of operating levers, a system of levers attached, respectively, to the sides of the car and the front end-gate, and adapted to operate the front end-gate, all substantially as described and shown and for the purpose set forth.

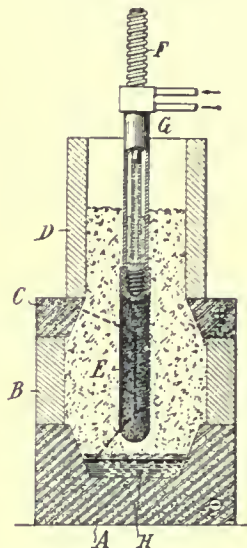
PERCUSSION-DRILL.—No. 871,350; Bradford H. Locke, New York, New York.



In a machine of the character described, the combination of a shell or casing, an internally grooved cylinder mounted to rotate therein, an end thrust ball bearing at the forward end of said cylinder, a lateral ball bearing at the rear end of said cylinder, an adjustable bearing at the rear end of said cylinder to prevent excessive movement from the forward

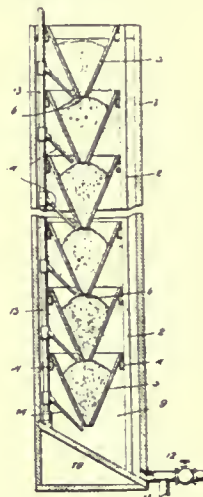
thrust bearing, a spirally grooved piston within the cylinder, a ball coupler engaging the piston and the cylinder, a piston shaft and a spring to drive the piston shaft in one direction.

ELECTRIC FURNACE AND METHOD.—No. 871,273; Paul L. T. Heroult, La Praz, France.



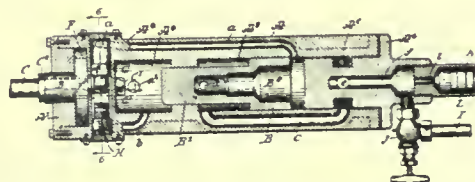
An electric furnace having a pair of electrodes, a conductor adapted to form a part of the path of the current between said electrodes, and means for shifting said conductor to vary the length of the part of the path formed thereby.

PROCESS OF LEACHING ORES.—No. 871,300; Alfred Schwarz, New York, New York.



The method of leaching ores consisting in causing the ore to descend by gravity through a series of hoppers submerged in a quiescent solvent, and introducing air into said solvent in the presence of the falling stream of ore.

ROCK-DRILL.—No. 871,594; Edward N. Jones, Victor, Colorado.



A rock-drill comprising a main cylinder, a hammer piston therein, a drill chuck in which the drilling tool is mounted to slide and to turn with the said piston, a pawl on the said drill chuck, a loosely mounted ratchet wheel engaged by the said pawl, an auxiliary cylinder connected by an admission port and by an exhaust port with the said main cylinder, an auxiliary piston in the said auxiliary cylinder, and means for connecting the piston with the said ratchet wheel to turn the latter

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TABLE OF CONTENTS

Editorial:	Page.
Notes.....	757
Goldfield Consolidated Report.....	758
Standards and Definitions.....	759
General Mining News.....	761
Special Correspondence.....	766
London.....	Cripple Creek, Colorado
Butte, Montana.....	Salt Lake, Utah
Toronto, Canada.....	Torreon, Mexico
Concentrates.....	772
Discussion:	
Capitalization of Rand Mines.....	W. Fischer Wilkinson 773
Thawing Dynamite.....	Francis A. Thomson 773
Rules for the Guidance of Employees Underground.....	Augustine Lawrence 773
A Word for the Miner.....	B. N. W. 773
Diamond Drilling.....	R. B. Weddle 774
Tube-Mill Lining.....	C. E. Rhodes, The Blaisdell Company 775
Cyanidation of Ore Containing Both Coarse and Fine Gold.....	E. M. Hamilton 775
Articles:	
The Roasting of Telluride Ores.—11.....	R. L. Mack, G. H. Seibold 777
The Tyee Smelter.....	Ralph L. Phelps 782
The History of Gold and Silver.....	James W. Macleod 784
A Chance to Get Rich.....	786
Carbons.....	Jacques Baszanger 788
Richardson Automatic Weighing Machine.....	789
Pipe-Threading Machines.....	790
Mining and Metallurgical Patents.....	787
Decisions Relating to Mining.....	788
Departments:	
Personal.....	761
Market Reports.....	761
Commercial Paragraphs.....	790
Books Received.....	790
Catalogues Received.....	790
Publications Received.....	790
Dividend.....	790

Editorial.

A GOOD INDICATION of the prosperity of the workingman in this country is afforded by the amount of money transmitted through the post-office from New York to Europe. In the two weeks ending on December 18, the New York post-office issued no less than 319,754 money orders, calling for \$5,366,771, an increase of 66,286 orders and \$1,156,698 as compared to the same period last year. Most of these orders represent Christmas remittances from immigrants to their people in the home country.

UNDER 'DISCUSSION' we publish a letter voicing some of the grievances of the working miner. To those that want to be fair in their dealings with employees, this letter will prove suggestive. While not endorsing all the statements made by the writer of that letter, it will serve to present one cause of the industrial troubles so hurtful to the progress of mining. The "inhumanity of man to man" makes many fight, as well as "mourn."

TUBE-MILLS and the lining of them with a resistant material are subjects of special interest to cyanide experts. The little controversy regarding the invention of the El Oro lining illustrates the fact that a good idea is apt to occur to more than one man at about the same time. We described this lining in our issue of October 12, on the basis of notes kindly communicated by Mr. Alfred F. Main, assistant manager to the El Oro Mining & Railway Company. It appears to be an excellent invention, whoever may be the inventor.

IN THIS ISSUE we publish the second portion of the article describing the results obtained in the experimental roasting of telluride ores. There is little information extant on this subject, and this fact alone would render the article valuable. Those who are engaged in the cyanidation of telluride ores, whether at Cripple Creek or Kalgoorlie, will be grateful to Messrs. R. L. Mack and G. H. Seibold, and to Mr. Thomas T. Read, also, for giving so many suggestive data concerning this branch of metallurgy.

THE SCANDAL associated with the failure of the California Safe Deposit Company has brought into prominence the names of the two Treadwell brothers, who were directors of the defunct institution and contributed to the catastrophe by their borrowings. These are the men who discovered the Alaska-Treadwell mine and sold it for something over a million dollars. James Treadwell was a carpenter and in his statement explaining the transactions that ended so disastrously he illustrates the danger of a gold miner dabbling in matters outside of his experience. It is pathetic to read of the attempt made by these once fortunate gold miners to make money out of

a coal mining enterprise based on deposits of "lignite of fair quality." The moral is again: "Shoemaker stick to your last."

A LITTLE PERSPECTIVE often aids mental vision, therefore the backward glance at the history of gold and silver, as given by Mr. James W. Malcolinson, will be appreciated. The relation of gold production to commercial activity has been brought to the front of late, but the problem remains sufficiently unsolved to be a subject for dispute. Undoubtedly the gold production of the world will begin to lessen soon, but when? Goldfields become exhausted, but new ones are discovered, and despite the skimming of the cream from off the natural concentrations of gold-bearing alluvium, the improvements in the economical treatment of ore are continually adding to the tonnage to be worked at a profit, and when the land has been exploited to a finish, is there not the ocean, which on the basis of 5 milligrams per ton of sea-water, contains something like 10,000,000 tons of gold. But the miner need not fear this source of supply, for the gold occurs in such a minute proportion as to defy any method of extraction as yet imagined.

The Goldfield Consolidated Report.

THE ANNUAL REPORT of the Goldfield Consolidated Mines Company, for the year ending on October 31, has been awaited with much interest because circumstances have united in placing this company in a prominent place among the mining enterprises of America. Ore of unusual richness, a picturesque setting, speculation in the stock, and labor troubles have been among the factors contributing to a dangerous prominence. We say dangerous, because pre-eminence of any sort invites the searchlight of criticism. Such criticism should be considerate, for the early development of the group of mines now consolidated was lacking both in system and economy, the leasing of the rich ground made direct control difficult, and the dependence upon a precarious ore market interfered with regularity of production. Nevertheless, any undertaking that appeals for public support must be amenable to public opinion and it is the particular province of journalism to guide such opinion. The consolidation at Goldfield was organized on November 13, 1906, with the Mohawk, Red Top, and Jumbo mines; and it was not until March 1, 1907, that the Combination was acquired. Therefore the annual report does not cover a full year. Owing to various strikes, 99 days of work were lost. At the time of acquiring control all these mines, except the Combination, were under lease to parties of miners, most of whom were extracting rich ore in a tremendous hurry, so as to make a maximum profit before the expiration of their leases. This, of course, interfered with systematic exploitation. The only mill worthy of mention as taken over with the mines was that belonging to the Combination, and even it was of only 60 tons capacity. Therefore, most of the ore was shipped to the smelters at San Francisco (Selby), Salt Lake, and Denver. A little ore was treated by local

custom plants, and most of the ore produced by lessees was sold through local ore-purchasing companies—that is, sampling works—which were unable to receive shipments as soon as the October panic disorganized the money market. On the whole, therefore, the conditions were unfavorable to economy or rapidity of production.

The Goldfield Consolidated is capitalized at \$50,000,000, in 5,000,000 shares at \$10 each. Stock to the par value of \$35,500,000 has been issued. This is quoted at the present time at about \$4 per share, making the market valuation about \$14,200,000. The report shows that the total profit for the year was \$1,760,358, and of this \$782,056 was in the form of royalties paid by the lessees of the Mohawk. When next the shareholder looks for figures of the tonnage from the different mines, for detailed costs, for segregation of accounts, or, in fact, for any such information as is usually given in the annual report of a company operating a large mine, he will find nothing but a confused and inconsistent jumble of figures. For instance, the production of the Mohawk is subdivided into "Ore Shipments (Gross)" and "Royalties—Gross Value." The first must refer to shipments made by the company and the second to those made by the lessees. Then a separate amount is put down to 'ore in transit' without indicating whether it was mined by the company or the lessees. Let it suffice to say that the arrangement of the various statements, as well as special items, is most confusing, even to one keenly interested in unraveling them. A page is devoted to an inventory of surface equipment, from a "Topman's Shelter" to a "Bench for Cutting Wedges", a mere childish enumeration of things without a single figure to indicate the original cost or present valuation. The maps were not made even by an ordinary mine draftsman; they are badly drawn, poorly lettered, and wretchedly printed. The general information regarding the mine is most inconclusive; three pages are given to 'Developments', but the absence of detailed figures as to width and assay-value of ore renders it all meaningless. Mining costs for the Combination are given as \$4.37 per ton and the milling cost for the same mine as \$7.14. Ore already broken is estimated at 24,987 tons, worth \$1,032,075. Mistakes in the additions remind us that in the original prospectus of this company there was an error of \$800,000.

Next comes the question of reserves. This is dismissed in a paragraph of nine lines. It is stated that "there is as much ore standing ready for extraction in the bonanza bodies as has been removed during the past year, i. e., at least \$5,500,000." As to further probable ore reserves it is said that "if the bonanza and low grades are treated together in a mill, I believe there is developed ready for extraction and treatment 1,000,000 tons of an average value of \$25 per ton, which should yield a profit of \$17 per ton." That is, the net profit available is \$17,000,000—a truly magnificent sum. The estimate may be well founded, but no adequate evidence is given nor any data such as would carry assurance to either an anxious or a hopeful shareholder. Finally, there is a parting word concerning "Advances in Geological Theory." The ore-shoots are described as "only extraordi-

inarily rich segregations within greater masses of quartz deposits which range from a few feet to more than 100 feet in width." The work of the past year has confirmed the idea that the lodes are "made up of elongated masses of quartz or silicified material in breccia fissures of great width, surrounding large irregular masses of porphyry." This description is particularly valuable as coming from a mining geologist of high standing, for such is Mr. John W. Finch, the general manager signing the report. Finally, we may add that by digging into this brecciated mass of information we have ascertained that the total output was 31,338 tons, having a gross value of \$6,296,476 or \$200 per ton. As the total profit was \$1,760,358, the net profit per ton was \$56, or 26 per cent of the gross. Having regard to the extraordinary richness of the product, this is a poor result. The company has paid one dividend of 10 cents per share, absorbing \$355,000, and carries forward \$1,547,190. It remains to add that the general manager signing the report resigned two months ago and nothing is published from his successor, who made a careful examination of the mine before he accepted the task of re-organization. Of course, a complete report by the new general manager, Mr. J. H. Mackenzie, would have proved a valuable supplement to that of the late manager, Mr. J. W. Finch, who continues in the service of the company as its consulting geologist. It is assumed that so experienced a man as Mr. Mackenzie would not have accepted the general management unless he had formed a cheerful opinion of the future of the enterprise, and this one inference is worth more to the stockholders than all the confused statements of the annual report of the company that controls the most productive gold mine in the world.

Standards and Definitions.

THE Institution of Mining and Metallurgy, an Anglo-American organization of mining engineers and metallurgists, with headquarters at London, has accomplished a great deal of useful work during the last few years and is entitled to the hearty respect of the profession that makes the whole earth its patrimony. Not being trammelled, as is our American Institute of Mining Engineers, by a clause in its constitution forbidding corporate expression of opinions, the Institution has led the way in standardizing usage and in defining good practice. For example, it has given a highly impressive funeral to the objectionable phrase 'ore in sight,' as being non-descriptive and misleading. By replies received to circulars sent to the members, it was ascertained that this unhappy phrase stood for very different factors in the appraisal of mines; to one man it meant ore blocked out, to another ore presumably existent but not blocked out, and to the public generally it conveyed an idea of certainty wholly foreign to an estimate. The result has been to taboo the phrase and to leave it to the charlatan; moreover, the discussion leading to the definition has done much to clarify notions concerning estimates of ore and to inculcate a carefulness highly favorable to good work among engineers and mine managers.

Next, the Council of the Institution adopted a resolution forbidding members to quote from its transactions in prospectuses "or any other documents published in connection with commercial undertakings" unless the written authority of each writer concerned is previously obtained. This discourages the distortion of descriptive and scientific statements into endorsements of questionable schemes. At the same time the Council recommended all members to insist upon their reports, when appearing in a prospectus, being distinctly dated, published in full, or else summarized only with the approval and signature of the engineer quoted. Of course, this is not binding on the outsider, on the unscrupulous or careless promoter, but the mere existence of such regulations among professional men is bound to influence the financial world and will do much to conserve methods within honorable limits. Only this week we heard of an injustice done to a friend by a reference to his report, without mention of the particular conditions upon which certain results were predicated. Most engineers have undergone the experience of seeing their old reports used in new flotations, that is, a report made on a mine when in a productive stage has been published years afterward when the mine has been depleted of the ore that formed the basis for the favorable opinion of an earlier date. Even well-meaning promoters have summarized the reports of their engineers in such a way as to convey promises not intended by those that wrote them. If the profession does not protect itself the public will not. All such measures are calculated to improve the professional standing of engineers and the Institution is deserving of the cordial support of mining engineers, metallurgists, and geologists the world over.

As if to give force to these suggestions, the Council is to have the right, by a majority of four-fifths of those present, and at least ten members of the Council being present, to expel any member who has committed an offence rendering him unfit to be a member. This is a practical step and will give a punitive power without which the recommendations by themselves might seem academic.

On the top of these activities, a campaign of standardization has been carried forward, with distinct success. 'Mesh' is no longer a haphazard term; it has been disciplined so that a measure of scientific accuracy has been attained. The short ton of 2,000 pounds has been adopted, and the hundredweights and quarters of an archaic terminology have been abandoned in favor of decimals of a ton. A 'miner's inch' is a flow of 1.5 cubic feet per minute and 'sluice head' represents a flow of 60 cubic feet per minute; but even these local terms are to be retired slowly in favor of definite expressions covering the flow of water per minute or per second, in cubic feet or in gallons. Gallon itself is to stand for the measure of 10 pounds of water. Bullion is to be sent to the verbal scrap-heap and returns are to be stated in terms of fine metal. On the whole, this standardization is a notable achievement and we recognize in the labors of the Institution a performance of far-reaching benefit to all those engaged in mining.

Personal.

ALLIENE CASE is at Elko, Nevada.

JAMES W. NEILL was here this week.

H. H. WEBB is here, on his way to Mexico.

W. H. LANDERS is at Wadsworth, Nevada.

PHILIP ARGALL will spend Christmas at Washington.

EDGAR RICKARD made a brief visit to Denver and Salt Lake.

J. POWER HUTCHINS has returned to New York from Oregon.

R. S. BLACK is now manager of the Kalgurli mine, at Kalgoorlie.

M. L. F. Effinger, of Silver Peak, Nevada, is at the St. Francis hotel.

W. E. DEFTY is examining mines in the Tombstone district, Arizona.

F. H. JACKSON lately at El Oro, is now at Inde, in Durango, Mexico.

H. P. GORDON is with the Mohawk mine at Michigan Bluff, California.

D. F. IRVIN, recently at Breckenridge, Colo., is now at Oakland, California.

CLAUDE T. RICE has left San Francisco and is now on his way to New York.

R. J. GRANT has been engaged recently in professional work at Cripple Creek.

CHARLES BUTTERS is expected in San Francisco on his return from New York.

ODELL WILSON, of Salmon City, Idaho, is temporarily at 463 Moss Ave., Oakland.

WILBUR E. SANDERS has opened an office at Los Angeles, in the Union Trust Building.

F. L. MORRIS has returned from Dawson. He has an office in the Monadnock Bdg., San Francisco.

P. C. STOEES will represent Pearse, Kingston & Browne at Seattle. His office is in the Colman Building.

WILLARD S. MORSE, of the American Smelting & Refining Co. is in San Francisco on a tour of inspection.

H. W. DuBois has arrived at Philadelphia, having ended a professional journey to the new goldfields of Nevada.

W. S. NOYES will open an office in the Mills Building on January 1. Since the fire his office has been at Oakland.

J. JEFFREY SCHWEITZER is assistant to the superintendent of the Keystone Mining Co. at Amador City, California.

W. M. DRURY is superintendent of the 600-ton concentrating mill at the Tecolotes mine at Santa Barbara, Mexico.

ARTHUR L. PEARSE sailed on the *Lusitania* from New York on December 14. He will proceed to examine copper mines in Corsica.

FLETCHER MCN. HAMILTON is permanently residing in Torreon, representing the Denver Engineering & Machinery Co., of Salt Lake City.

A. G. KIRBY, mill superintendent and metallurgist of the Goldfield Consolidated Mines Co., of Goldfield, Nevada, was in Denver for a few days on his way to the San Juan district.

JOHN A. RICE has severed his connection with the Chemung Copper Co. at Tyrone, New Mexico, and will resume his practice as consulting mining engineer, with offices at El Paso, Texas.

L. H. TAYLOR, recently in charge of reclamation work in California and geodetic surveys in Nevada, has been appointed supervising engineer with the California-Nevada Power Company.

N. C. GROCH has resigned as general mill superintendent with the New York & Honduras Rosario Mining Co., of San Juanito, Honduras, and has returned to his home at Sandusky, Ohio. He expects to return to Nicaragua, where he has some mining concessions.

Latest Market Reports.

LOCAL METAL PRICES—Dec. 19.

Antimony.....	13@17c	Quicksilver (flask).....	\$45.5
Casting Copper.....	18@19c	Spelter.....	6@ 6.75c
Pig Lead.....	3.85@ 4.80c	Tin.....	35@36½c

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.				
Date	Electrolytic Copper	Lead	Spelter	Silver
Dec. 13.....	13	3.70	4.28	54½
" 14.....	13	3.55	4.23	54½
" 15.....	Sunday. No market.			
" 16.....	13	3.55	4.18	54½
" 17.....	12½	3.45	4.16	53½
" 18.....	12½	3.40	4.16	52½
" 19.....	12½	3.40	4.16	53

ANGLO-AMERICAN SHARES.

Cabled from London.

	Dec. 12.	Dec. 19.
	£. s. d.	£. s. d.
Jamp Bird.....	0 14 0	0 13 6
El Oro.....	1 1 3	1 1 3
Esperanza.....	1 10 0	1 10 0
Dolores.....	1 0 0	1 0 0
Oroville Dredging.....	0 14 0	0 14 0
Stratton's Independence.....	0 3 6	0 3 3
Pomboy.....	1 10 0	1 10 0

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

MINING STOCK QUOTATIONS—NEW YORK.

Closing Prices.

	Dec. 11.	Dec. 18.
Bingham Central.....	½	¾
Boston Copper.....	10	10
Cumberland Ely.....	5½	5½
Dolores.....	5½	5
El Rayo.....	1½	1½
Guanajuato Con.....	2½	2
Glroux Con.....	2½	2½
Nevada Con.....	7½	7¾
Nipissing.....	6½	6½
Tennessee Copper.....	28	28
Tonopah Ex.....	1½	0.89
Tonopah-Belmont.....	1½	0.75
Tonopah.....	6½	5
United Copper.....	7½	7¼
Utah Copper.....	15½	17½

(By courtesy of Hayden, Stone & Co., 25 Broad St., New York.)

SOUTHERN NEVADA STOCKS.

San Francisco, Dec. 19.

Atlanta.....	\$ 33	Laguna.....	75
Belmont.....	90	Manhattan Con.....	25
Columbia Mtn.....	* 21	Midway.....	55
Combination Fraction.....	81	Mizpah Extension.....	20
Daisy.....	1.10	Mohawk.....	11.00
Fairview Eagle.....	40	Montana Tonopah.....	1.75
Florence.....	4.27½	Nevada Hills.....	3 15
Gold Bar (Bullfrog).....	40	Red Top.....	2.00
Goldfield Con.....	5.27½	Sandstorm.....	23
Goldfield of Nevada.....		Silver Plek.....	31
Gold Kewanas.....	27	St. Ives.....	51
Great Bend.....	34	Tonopah Extension.....	1.55
Jim Butler.....	43	Tonopah of Nevada.....	5.25
Jumbo.....	2.00	Tramp Con.....	19
Jumbo Extension.....	61	West End.....	35

(By courtesy of W. C. Ralston, 368 Bush St.)

COPPER SHARES—BOSTON.

Closing prices. Dec. 19.

	Dec. 19.		Closing prices. Dec. 19.
Adventure.....	2	Michigan.....	8
Ahmeek.....	25	Mohawk.....	43
Allouez.....	25¼	Nevada Con.....	7¼
Amalgamated.....	44½	North Butte.....	39¼
Arcadian.....	3¼	Old Dominion.....	27¼
Atlantic.....	8¼	Osceola.....	80
Balaklala.....	2¼	Parrot.....	9
Bingham Con.....	4½	Phoenix.....	50
Boston Con.....	10	Quincy.....	75
Butte Coalition.....	13¾	Raven.....	80
Calumet & Arizona.....	94	Rhode Island.....	2½
Calumet & Hecla.....	590	Santa Fe.....	1¾
Centennial.....	23¾	Shannon.....	9¼
Con. Mercur.....	27	Superior & Pittsburg.....	8½
Copper Range.....	54	Tamarack.....	63
Daly-West.....	8½	Trinity.....	14½
Franklin.....	7	United Copper com.....	7¼
Granby.....	70	Utah Copper.....	17½
Greene-Canaan, ctf.....	5½	Victoria.....	4¼
Isle Royale.....	17	Winona.....	4
Mass.....	2½	Wolverine.....	108

General Mining News.

ALASKA.

Preliminary work on the Bonanza copper mines in the Copper River country will be rushed this winter, so that several hundred men may be employed in the spring. The Copper River & Northwestern railroad is being constructed to these mines. A sawmill of large capacity is being shipped to the property and plans have been completed for the construction of a score of buildings.—H. C. Strong, it is reported, has made a big copper find near Mt. Andrew in the Prince of Wales district.—Peter Monohan, William Grogg, and Sidney Woffington reached Valdez on Dec. 3. They brought \$80,000 in gold dust, secured from a bench on Valdez creek, at the head of the Susitna river.—A. H. Brooks, chief of the United States Geological Survey's Alaskan Division, reports that various unfortunate conditions have led to a material reduction in the gold output of Alaska as compared with that of the previous year. Preliminary estimates indicate that the gold production for 1907 will be between \$17,000,000 and \$18,000,000, as against more than \$21,000,000 last year.

ARIZONA.

COCHISE COUNTY.

The Duluth-Chiricahua company has done about 300 ft. of development work this year on its group of claims near Paradise. J. C. Sweeney is superintendent. Some good ore was found in the Eighty-six claim. The cross-cut adit on this claim is about 60 ft. long; in the face of the adit the ore occurs. One of the shafts belonging to this company is 90 ft. deep, the other 70 ft. In the latter sinking had to be suspended until a pump is installed. Consequently a drift was run from this shaft just above water-level; ore has been found in this. On the Sullivan claim belonging to this company there is considerable good copper carbonate ore.—At the Emerald mine at Tombstone the width of the orebody, recently discovered, has not been determined, but the cross-cut which is 30 ft. long is still in ore. The winze is also in ore. This ore is a black copper sulphide carrying some lead and silver. The orebody was found about 50 ft. below the water-level. A new vertical shaft is to be sunk farther up the hill and a little south of the present shaft. The company will soon begin to rebuild the head-frame at the Lucky Cuss shaft. Much assessment work is being done on claims near the Emerald mine owing to the recent developments at that mine.

At the Manhattan mine the force has been increased to ten men; the work being done consists of driving the Demarest and Smith adits and building necessary trails.—Six men are employed on the Jno. A. Duncan group.—The Calumet & Arizona Mining Co. has started an additional furnace at its smelter in Douglas. It has now the same number of furnaces in operation as before the disturbance in the copper market.—The Anderson-Apache Co. has let a contract to William J. Williams for sinking and timbering the main shaft down to the 300-ft. level; Mr. Williams engaged nine miners from Bisbee.

GILA COUNTY.

At the Old Dominion mine progress on the sixteenth level has been rather slow on account of the changing of machinery. A sulphide-bearing vein has been exposed for about 15 ft., but the rich ore expected has not been reached. The ore developed carries about 4% copper. A drift is being extended practically along the foot-wall to ascertain the probable length of the sulphide ore-shoot.—In the cross-cut at the Mallory mine, the sulphide vein has not been reached; a seam carrying a high copper content was found. By Jan. 1 cross-cutting will be commenced at the Gem shaft; the station is now being cut on the twelfth level.—The Miami Copper Co. has been organized to take over the Alsdorf properties in the Globe district. Work on the property began a year ago. About 4000 ft. of development work has been done; three levels have been opened on the Red Spring claim. Until recently 60 men were employed, but owing to a strong flow of water the force was cut down to

half that number. Louis A. Wright, consulting engineer for the company, has called for bids from the machinery houses for a 250-hp. hoist, air-compressor, drills, and pumps; upon the installation of this plant the force of miners will be increased.—The Arichise Copper Co., which recently opened a good vein of copper ore, north of Safford, is making regular shipments.

GRAHAM COUNTY.

While the new furnace at the Shannon smelter is being broken in, the two old furnaces have been put into first-class shape. The intention is to transform these into one large furnace as E. P. Mathewson has done at the Anaconda smelter. When this is done the Shannon smelter will have a capacity of 3,000,000 lb. of copper per month. The company has laid in an ample supply of fuel, so as to avoid the trouble experienced last winter. At the Coronado mine the company has developed a large tonnage of ore. When the price of copper improves, the ore from the New England & Clifton mines, and also that from the mines belonging to the Arizona Commercial Co. will be treated at



Map of Arizona.

the Shannon smelter.—Rich silver ore, carrying some gold, has been found on the 175-ft. level in the Lillian claim. The company is sinking and driving on this ore-shoot. — — — — —

MOHAVE COUNTY.

At the Treasure Hill mine good silver ore has been found in the north drift.—Good silver ore has also been found on the group of claims belonging to Walter Brown and George Lockwood. The property is between the old Sixty-three and the Treasure Hill mines. The ore was found in the adit, the vein being four feet wide; there is a small streak of rich silver ore in the vein, but the ore is mainly galena.—On the 800-ft. level of the Gold Road mine the west drift has been in good ore for 7 ft.; two shifts are working in this drift. The French shareholders desire to develop the mine to a depth of 1,000 ft. before improving the mill, so as to be sure of the extent of the orebodies. On the other hand, the American shareholders contend that the saving in the cost of milling and the increased extraction will more than pay for the new mill before the orebodies are exhausted.

PIMA COUNTY.

At present 20 men are working at the Twin Buttes property, but the force will soon be greatly increased.—Several new orebodies have been found at the Pueblo mine, near Tucson. The company is preparing to make another shipment of ore.

PINAL COUNTY.

The installation of machinery has been completed at both the Alta and the Oklahoma mines, near Florence, and mining will soon be resumed.—At Ray the Hercules & Arizona Co. has resumed.—In the Saddle Mountain district, at the Two Queens gold-copper property, much development work is being done.—The main adit at the mine belonging to the Central M. & D. Co. is now 450 ft. long; one of the shafts is 182 ft. deep. The force of miners will soon be increased, as considerable development work will be done this winter. The company has made five shipments already.—The Calumet & Arizona company has installed a hoist on its claims near Mammoth.

SANTA CRUZ COUNTY.

At the old Cerro Colorado mine, in Arizona district, 40 men are working. Charles Udall is superintendent. The shaft is 400 ft. deep and will be sunk to a depth of 500 ft., where cross-cutting will begin. Heavier hoisting equipment has been ordered; while the company is waiting for the arrival of that, work has been stopped in the shaft. Development continues in other parts of the mine.

The Nogales Consolidated Copper Co. is continuing development on its property; it has found two 3-ft. veins of free-milling gold ore that assay from \$4 to \$5 per ton.

CALIFORNIA.

ELDORADO COUNTY.

Work is being pushed at the Pre-Volcanic mine, in Pacific district, and the prospects are said to be satisfactory; nine men are employed.—At the Gardner Consolidated mine, in Big Canyon, three men are taking some fine ore from a drift which they are running from the main adit.—At the Mt. Pleasant mine the new company now operating the mine under a bond are preparing for extensive work. The force at the mine will be increased to 12 men on the first of the year.—Wm. Craddock is ground-sluicing on his property in Big Canyon in order to uncover several porphyry lodes.—Forty tons of ore from a mine in the city of Placerville are being crushed in the two-stamp mill of B. Pappina & Son.

INYO COUNTY.

A group of claims in Black Canyon, being developed by Chas. Bishop and J. B. Ellis, has yielded some ore of shipping grade. Copper and gold are present in some of the ore, but the earlier specimens displayed contained much silver and lead. The work done so far has been little more than location requirements, but has shown the existence of strong lodes.—The owners of the Gold Bug and Gold Dollar groups at Snyder's Camp, near old Chrysopolis, recently visited the property and expressed the intention of providing working facilities on a large scale. The principal opening is a shaft 50 ft. deep, from which a drift 50 ft. long has been run on a vein averaging six feet of ore. The ore is said to carry considerable gold. Another shaft 40 ft. deep exposes a vein eight feet wide, carrying gold, silver, and copper.

NEVADA COUNTY.

Now that the Kenosha mine has been unwatered, a crew of men are sinking on a good lode. The new machinery is working well and the shaft is making excellent progress.—It is reported that a good shoot of ore has been encountered in the New York-Grass Valley mine. Only a small crew has been at work, but it is probable that this discovery will lead to the working of the mine on a large scale.—The South Yuba M. Co. has found native copper in its adit No. 6, 400 ft. from the portal. The lode outcrops on the surface 300 ft. wide, and was formerly known as the Red Ledge. A new adit will be started in order to develop the ore at a lower level. A 5-ft. quartz vein was also cut in adit No. 6.—The body of ore recently found in the Idaho-Maryland mine is strong and the walls well-defined. This ore-shoot is entirely separate from that which made the mine famous years ago, when it was known as the Idaho.—At the Norambagua practically nothing is being done, but arrangements have been made for the necessary machinery to resume work in the spring. At the Champion mine, a 6-ft. vein of ore of excellent quality was found on the 800-ft. level;

the find is regarded as the most important yet made on that property. The development was made in the hanging wall south of the Champion shaft, in territory which the Champion company acquired some years ago from the Providence company. The latter company had done much exploration work in that district, and had narrowly missed making the discovery years ago.

L. B. Clark and Henry Goering are opening up a placer mine near Round Mountain.—An important strike has been made in the Young America drift mine on Oregon creek. For several years a company has been tunneling an adit to get beyond the old workings; bodies of gravel thus found heretofore proved of small size, but that recently opened appears of greater promise.

PLACER COUNTY.

(Special Correspondence).—The Three Star mine of Ophir is working about 35 men. It has 10 stamps crushing ore. This is one of the mines that the panic has not hurt. Most of the gold is free.—The Placer Gravel Mining Co. at Last Chance has found the bench at the lower end of their ground; they have been driving for it for some time. There is good gravel at this point.—At the Rubelin quartz mine at Last Chance there has been installed a Pelton wheel, using water under a 90-ft. head to furnish power for the 2-stamp mill; most of the gold here is in free and is caught on the plates. Thirty-two feet of blanket sluices are used to catch the sulphides. The ore yields a little under \$10 per ton on the plates. As far as developed the lead shows up well.—The United Water & Power Co. at Gold Run is using three Woods drills in breaking gravel; this gravel is a hard cement. It is crushed in a 10-stamp mill. Impulse wheels generate power for the mill and air-compressor.

East Auburn, Dec. 18.

SIERRA COUNTY.

Much activity is shown in the mines near Alleghany on account of new strikes.—Glasson and Empfield are developing the Nancy Lee claim on Buckeye hill.—The work of pumping out the shaft at the Independence quartz mine on Wolf creek, below Alleghany, has been commenced.—Cook, Spellenberg, and Devine have found some rich ore at the Bullion mine. This new vein is on the foot-wall side of the one formerly worked.—The Sovereign mine has been closed for the winter, except that two shifts will continue driving the adit.—A small force of men is employed at the Hayes mine.—At the Plumbago mine a rich pocket of gold quartz has been struck. It is in the deepest part of the mine, at a vertical depth of about 1,000 ft. from the surface, and 2,000 ft. from the portal of the lowest adit-level. Three shifts of men operating machine-drills have been mining the quartz, which is sacked and sealed before being taken out of the mine.—The Rainbow mill is crushing 50 tons of quartz per day.

SISKIYOU COUNTY.

The Seiad company has been organized at Palo Alto to operate a hydraulic mine on Seiad creek.—A strike of rich ore is reported from the Taylor Creek basin. While tracing up some surface prospects the owners uncovered a lode which contains specimen ore.—At the Zarina mine, on Taylor creek, power is being developed to operate an air-compressor. A 5-stamp mill is being supplied with ore from the mine.—Welch & Sons have a large force of men installing a hydraulic elevator at their claims on Grouse creek.—At the Fred Beaudry group of placer claims on the South fork of Scott river the ditches and flumes are being repaired; it is intended to work two giants this season.—The mine on Sugar creek, recently purchased by H. S. Hinzey, has about 40 men at work. A sawmill has been installed and buildings for living purposes erected. The men are excavating for a 10-stamp mill.

TUOLUMNE COUNTY.

Troubles have broken out anew in Angels Camp between some of the mine operators and the miners. On Dec. 9 when the night-shift reported at the Lightner mine, they found a notice posted that hereafter miners would have to work nine hours underground. This meant that the men would have to change, and go up and come down on their

own time. The night-shift, numbering about 75 men, refused to go to work. The management of the Lightner removed the notice in the morning and the men returned to work. At the Utica company's properties, where the management was about ready to put on a large force of men the notice is posted. Result, no men are at work. Other mines about Angels are not affected.—The Black Oak mine has been bonded to S. A. Knapp, of Oakland.

IDAHO.

NEZ PERCE COUNTY.

Escallon & Anderson, the San Diego company, and the Wild Rose company are driving adits for the development of their properties in the Pierce City district.—A find of rich ore, it is reported, was made at the Gold Dollar mine; it is owned by Frank Hye and Ed. Ford.—A. Allardyce, of Chicago, has secured control of the Union group, which is situated on Seigle creek; further development work has begun.—Preparations are being made to develop the Occident mine. It is proposed to drive a 1000-ft. adit; this is expected to develop ore at great depth beneath a fine outcrop.—The Bassler M. & M. Co., of Rocky Bar, has begun

Miners' Union, No. 220, was bitterly arraigned. In part the document reads as follows:

"That this organization is a conspiracy in restraint of trade among the States is evident. The mines and mills of Goldfield produce and handle ore that is nearly all shipped to other States and there converted into metals. This organization interrupts and prevents this interstate business. We also charge that this organization is treasonable in character. While perhaps no overt act of levying war or adhering to the enemies of the United States might be proved within the technical definition of treason given in the Constitution, the intent and purposes are ever present. This so-called union carries the red flag in its procession, eschews the Stars and Stripes and lines the walls of its meeting places with anarchistic and treasonable utterances. It has foresworn its allegiance to the United States and placed itself under the blood-red banner of anarchy. So far as the mine owners of the Goldfield mining district are concerned, we have taken our stand and propose to remain there. We will not now nor in the future compromise with crime. All that this Association asks is the privilege of working its properties upon fair, just, and equitable terms. We make no war against labor unions, but on the contrary prefer union labor, believing it to be generally better than non-union labor. On the other hand, if we cannot procure miners except they be members of the Western Federation of Miners, we prefer non-union labor. We do not regard the Western Federation of Miners as a labor organization, but believe it to be an organization controlled by socialists and anarchists, who, parading under the name of a labor organization, desire to produce such turmoil and confusion between employer and employee that their socialistic and anarchistic program may be carried out. We would also call attention to a provision in the constitution of the Western Federation of Miners to the effect that 'no local union or unions of the Western Federation of Miners shall enter into any signed contract or verbal agreement for any specified length of time with their employers.' That is, no agreement for peace is to be made that cannot be broken the next day and the warfare so dear to the heart of the socialists and anarchists renewed. We submit that these declarations themselves are a declaration of war between this organization and trade unions, and place this body beyond the pale of a labor union or lawful organization." Besides asking for the prosecution of the Western Federation, the operators ask for the protection of life and property which comes from the presence of a body of United States troops. The Federal Commissioners commenced work Dec. 16, by holding extended conferences with both General Funston and Governor Sparks. The investigation, it is now believed, will consume fully a month, even though the work proceeds without interruption. Representatives of both sides will be heard, as well as witnesses from the middle party, the citizens and merchants of Goldfield. These different depositions will be recorded by two stenographers and will be used to form the report which will be later submitted to the President.

More men went to work Dec. 16 at the mines and mill of Jumbo town, the site of the richest producing properties in this district, and the place where Camp No. 2 of the regulars is pitched. The Combination mine is now running three full shifts, keeping up work night and day. The Combination mill is admitted to be working short-handed, but its output is almost what it is in peaceable times. The Little Florence Mining Co. has 20 men on the pay-roll, and 50 are expected to be at work tomorrow. The Nevada Goldfield Reduction Co.'s plant is running regularly now with three shifts. The mine operators say that within 10 days, when parties of strike breakers have arrived in large numbers, every heavily producing mine in the district will be working again. Neither military nor civil authorities will be asked to look after these strike breakers. This has been settled. The operators of the different mines have decided to hire and arm their own guards, and they have commenced to make arrangements to feed and shelter them.—The Pittsburg-Silver Peak Co. has secured sufficient power to enable it to operate 20 additional stamps of the mill; it expects to have these dropping by January 1.



Map of California.

driving an adit which will cut the lode at a depth of 650 ft.—At the Potosi mine, the work of sinking the shaft from No. 2 level is in progress.—The Perseverance M. Co. at Flint, it is reported, is taking out some high-grade ore; 11 men are employed.—In a raise from a lower tunnel, the Village Blacksmith M. Co. has found good ore.—The De Lamar company has the poles set and wires strung for its power line from Dewey; electric power will be substituted for steam at the mill.

NEVADA.

ESMERALDA COUNTY.

On December 16, the Mine Owners' Association of Goldfield asked the United States Government to bring suit against the Western Federation of Miners for the dissolution of that organization as a trust, combination, and conspiracy in restraint of trade. The Government was also urged to bring criminal proceedings against the organization, its officers and members, for the same reason. The petition was presented to the Commission appointed by the President to investigate labor conditions at Goldfield, upon its arrival. The petition consists of 6,000 words. The Western Federation of Miners, and particularly the Goldfield local,

LINCOLN COUNTY.

The double-compartment shaft at the California-Pioche mine is now 100 ft. deep and will be continued to a depth of 300 ft.—A diamond-drill has been installed at the claim of the Nevada-Des Moines Corporation, near Pioche. The result of the operation of the drill will be watched with interest by the local mining public, for it is the first attempt made in the district along this line.—Wells, Fargo & Co. shipped through their agent, B. F. Sides, for the Meadow Valley Co., 17 bars of bullion valued at \$17,965.39.

LYON COUNTY.

A contract has been let for driving an adit at the Wilson Gold Mines Co.'s property at Mountain View.—A width of 5 ft. of mineralized porphyry carrying chalcopyrite is reported to have been found in the bottom of the shaft of the Yerington Copper Co.'s mine.—The McConnell company is sinking a three-compartment shaft on its property; it is to be continued to a depth of 500 ft.—The 5-stamp mill at the Wheeler mine is treating 10 tons of ore per day; Fred. Flindt is general manager.

NYE COUNTY.

The ore shipments from the Tonopah mines for the week ending Dec. 12, as reported by the Western Ore Purchasing Co., amounted to 1,381 tons. The Tonopah company shipped 1,040 tons; Belmont, 151; Tonopah Extension, 89; Midway, 95 tons. The Tonopah company sent 2,380 tons, the Belmont company 1,080, and the Montana-Tonopah 1,100 to the mills, making the total shipments for the week 5,935 tons, having an estimated value (the shipping ore being valued at \$70 per ton and the milling ore at \$30 per ton) of \$233,030.—The Tonopah Midway is developing the big vein at the 800-ft. level, besides mining and shipping the usual quantity of ore from the upper levels.—The Montana-Tonopah is developing on the fourth and below the fifth level.—The North Star is developing at the 1,250-ft. level, and is sending some ore to the Montana mill from the 900.—The West End is doing such work as seems best to prove its contention in the coming suit with the MacNamara.—On account of the financial condition, it was deemed advisable to stop work at the California for the present.—The north cross-cut of the 850-level at the Little Tonopah is now about 500 ft. long; stringers carrying good silver ore are being encountered frequently. The Little Tonopah ground is being developed by the Tonopah Geodetic company, composed of Los Angeles capitalists; the work has been carried on without interruption for the past two years. The lode porphyry was struck in the shaft at a depth of 810 ft., and after penetrating the porphyry 40 ft., the cross-cut was started to the north. The shaft was continued to a depth of 925 ft.; sinking stopped some time ago.

The Otero mine in East Manhattan is being developed; some good sulphide ore was found in driving easterly 50 ft. from the shaft.—A. D. Sly and J. A. Carr are sinking a shaft on the Saddleback claim of the Round Mountain Extension property. The lode, which was formerly worked in a neighboring incline, is well defined and carries free gold.—Bids are now in for the construction work and lumber on the new Sphinx mill. The winze in the Sphinx mine, which was started last October to connect with the 200-ft. level, has been finished and the orebody is being cross-cut.—The Lemon mill at Manhattan has started on ore from lease No. 13 on the Union No. 9 claim.—The Round Mountain Monster Mining Co. has been steadily at work developing its tungsten property. An adit has been driven into the mountain over 200 ft.; it is expected soon to begin a raise to connect with the upper workings.—A 6-ft. Huntington mill is to be installed at the Madigan lease at Round Mountain.

WHITE PINE COUNTY.

At the Veteran mine the force has been increased to 200 miners; these men are employed principally on the 381-ft. level and in sinking the new four-compartment shaft, which is now 60 ft. deep. This shaft will be sunk to a depth of 450 ft. and will become the main hoisting shaft for the Veteran mine. From the Manhattan adit a winze is being sunk; this is now 80 ft. deep. A raise is being advanced from the lower level to meet this winze; it is thought that connection

will be made by the middle of the month. The ground from the raise, which will be started to meet the main shaft, will be hoisted through the old shaft and this winze; it is thought that the main shaft will be completed by Feb. 1. Work on bins and other construction, necessitated by this shaft, is hastened. The pipe-line to carry water from Holt creek to the Veteran has been completed. This will furnish plenty of good drinking water for the community that will grow up around the Veteran shaft. The new pipe-line is composed of 8 and 6-in. mains, and is 12 miles long. The steam-shovel is now working on the 'high line' between Ely city and the smelter; grading will be completed soon after the middle of the month.—At the Glroux Consolidated mines considerable work has been done since October, but at the Nevada Con. properties very little development work has been done.—At the smelter the main water-line has been completed. The hydro-electric plant, being built to use the overflow from this system, is being rapidly carried along. All the men that can possibly be worked are now



Map of New Mexico.

hastening the first unit of the concentrator at McGill to completion. This will be completed about Jan. 1. Probably the trestle to the mill will not be finished by then.

NEW MEXICO,

The Excelsior M. & D. Co., which operated mines in the Jarilla district, has gone into the hands of a receiver.—The Mineral Point mine, at Hopewell, is being worked by E. C. Sterling.—A carload of new machinery has been received by the San Pedro mine in Santa Fe county; it is thought that when it is installed the smelter will resume operations.—The Laura mine is shipping ore to the Copper Queen Consolidated Co. at Douglas. The vein is 12½ ft. wide in the bottom of the shaft. In driving southward from the shaft a second good ore-shoot was found.—The Twin Peaks M. & M. Co. has ten men sinking the main shaft; they are taking out first-class ore.—The Emma mine is operated under a lease by C. P. Cramer. The weekly shipment varies between two and three carloads of fair-grade copper ore.—It has been decided to erect a 100-ton smelting plant at a point convenient to the property of the Bessemer Copper Mines Co. at Fierro.

SOROCCO COUNTY.

(Special Correspondence).—The Treasure Mining Co., owner of the Confidence mine, will rebuild the pipe-line and will re-open the mine, which already shows several million dollars worth of ore. A cyanide plant will be erected to treat the ore from this mine. The process to be installed is the one designed by W. C. Paterson, who has

been doing considerable experimental work on the ore for the past six months. Mr. Paterson is now in Scotland and England, but will return in a couple of months.

Mogollon, Dec. 7.

SOUTH DAKOTA.

CUSTER COUNTY.

Work is in progress on the ground of the Hartwell M. Co. near Lightning creek, about 7 miles southwest of Custer. The main vein is about 40 ft. wide and has been opened in a number of places by shafts, cuts, and adits. It lies between walls of hornblende schist and slate. There are a number of parallel and cross veins on the property, but the principal work has been confined to the main lode; it is estimated that 134,800 tons of ore have been developed.—A large number of men have been employed moving machinery and supplies from Spokane to the Eagle Mountain and King Oscar mines; they are being prepared for extensive mining operations.—At the Reliance mine some important improvements are being made. Machinery recently received consists of one 6-ft. Huntington mill, one 10-drill air-compressor, one 100-hp. electric motor, and five air-drills. When this machinery is installed it is thought the capacity of the plant will be 150 tons per day.—The Providence Mining Co. is shipping 30 tons of amblygonite from its Peerless mine every five days.

LAWRENCE COUNTY.

The Crown group of mines, on Castle creek, was purchased a short time ago by parties represented by Jas. A. Clark. It has just been resampled. A force of men will soon be engaged to start mining and erect the necessary buildings.—At the Connie May Morris group a shaft is being sunk between two strong lodes about 30 ft. apart and when a depth of 100 ft. is reached it is proposed to drive each way to the veins. R. K. Spencer is superintendent.—E. Taylor and N. Lee are investigating the Victor Anna group of mining claims which consists of 440 acres of land.—The new hoist being built for the Minnesota Mines company at Maltland is nearly completed.

WASHINGTON.

FERRY COUNTY.

(Special Correspondence).—The Oversight M. & M. Co. is advancing the cross-cut adit on the Pin-Money claim. Although the main vein has not yet been intersected, the adit has passed through other veins which show considerable high and low-grade ore; the ore in the upper half of the face of the adit is of good grade. At present only four men are employed; an addition has been made to the boarding and bunk-house, and the force will be increased about Dec. 15. E. J. Delbridge is manager for the company.—The Copper Key mine has been shut down for 10 days, but is working again; 20 men are employed. The cross-cut from the No. 2 adit has been in ore for the last 78 ft.; this ore is an iron sulphide, carrying gold and copper. A new adit has been started several hundred feet south of the No. 3, to develop the vein about 150 ft. below the No. 2 adit-level; a 100-ton bin is being built near the mouth of this adit. A 32-hp. gasoline engine and a No. 10 Fairbanks air-compressor and receiver are being installed. Two Ingersoll-Rand drills will be used in the future.—The financial stringency has effected some of the companies operating in Belcher district; the Winnipeg company has temporarily suspended operations. The Winnipeg is in a great measure affected by the Belcher Mountain railway being tied up by an accident. This company has made one shipment to the smelters. Further shipments will have to be suspended until the railway is repaired. There is considerable good ore developed in the Winnipeg mine.—The miners employed by the Colville M. & S. Co. on the North Half Colville group have been paid and the mine temporarily closed.—The Blue Bell-Belcher M. Co. has erected a blacksmith shop and substantial winter quarters for the men. Work has been resumed in the adit, which is about 260 ft. long.—A new strike has been reported at the California mine. The shaft and old workings are being unwatered.—The Pearl Consolidated M. Co. has given an option to J. I. Harper, who

represents the Syndicated Deep mines, for the purchase of the Lone Pine, Pearl, and Surprise claims. The purchase price, as agreed, is to be \$10,000, provided this is paid March 1.

Republic, Dec. 12.

CANADA.

BRITISH COLUMBIA.

The output of the Rossland mines for the week ending December 7 was as follows: Centre Star, 4,410 tons; Le Roi, 2,100; Le Roi No. 2, 605; total, 7,115 tons.—At the Hewitt mine an air-compressor and an electric generator will be installed.—A carload of high-grade ore was shipped to the Trail smelter from the Duncan mine near Midway.—The Millie Mac mine, which is situated about 12 miles from Burton City, is expected to produce for shipment between 300 and 500 tons of ore this winter.—It is said unofficially that a cross-cut is being driven from the Le Roi workings for the purpose of cutting the main lode of the Spitzer mine at depth.—The Evening Star mine, which has not been operated since 1902, resumed shipments during the week.—The development of the new ore-shoot in the Le Roi No. 2 mine continues satisfactorily.

At the Trail smelter there was received during the week ending December 6, 5,407 tons, and for the year to the same date 248,029 tons. The ore received last week was from the following mines: Centre Star, 2,940 tons; St. Eugene, 263; North Star, 124; Silver King, 85; Vancouver, 84; Rambler-Cariboo, 23; Whitewater Deep, 44; Slocan Sovereign, 26; Wakefield, 24; American Boy, 23; Ferguson, 28 tons.

At the Le Roi smelter at Northport shipments were received as follows during week ending December 6: Le Roi, 2,517 tons; First Thought, 133; Queen, 24 tons. Total for the week, 2,679 tons, and for the year, 248,029 tons.

The employees of the Granby Consolidated Co. have agreed to accept a reduction in wages. The directors of the company have decided to reopen the mines on December 5, and the smelter two or three days later; they give employment to 900 men when operating at full capacity.—The Venture company has been organized at Barkerville to operate two miles of creek leases on Peters creek, which empties into Lightning creek, seven miles below the town of Van Winkle. Eight men are building a sleigh road from Mather's camp to the lower end of the Venture company's ground.

CARIBOO DISTRICT.

At the China Creek hydraulic mine 90,000 cu. yd. of gravel were piped during the season ending Nov. 2; this, owing to the greater hardness of the bank, is less than last year. The middle ditch has been extended one-half mile, a new penstock built, and the length of the pipe-line increased 400 ft. This has increased the pressure at the monitors from 200 to 300 lb. per cu. in. Two monitors are used, a No. 5 equipped with both six and seven-inch nozzles, and a No. 3 with three and four-inch nozzles. The material is washed into two sets of 36-in. sluice-boxes laid at a grade of 7 in. to 12 ft.; an undercurrent was put in during the season. By using undercurrents the sluice flumes were shortened from 1,000 to 200 ft. The width of the channel is 260 ft., its grade, which has averaged from 7 to 8½%, is less steep near the head of the cut, where it averages about 4 or 5%. During the season 246 ft. of new flume was built on the ditch line to replace worn out flumes and trestles. The new flume is laid on the ground because its cost is no more than if built on trestles and it will be much more durable. The clean-up of gold for the past season showed the yield per cu. yd. to be about the same as last year. B. A. Laselle is managing owner and W. V. Brown, foreman.—At the Nugget Gulch hydraulic mine between 60,000 and 65,000 cu. yd. of gravel were piped during the season, which ended Nov. 3.

EAST KOOTENAY DISTRICT.

The shipments from the mines of the East Kootenay district for the past week were as follows: Sullivan, 600 tons; St. Eugene, 430; North Star, 75; total, 1,105 tons.—The link-belt conveyors for the new sorting-house at the St. Eugene mine have arrived and will be installed as soon as this building is completed. The old platform scales for weighing cars at the mill is being replaced by a larger one.

Special Correspondence.

London.

Ambiguous Statements.—Lack of Information to Shareholders.—Mt. Lyell Co.—Simmer & Jack.—Australian Smelting Corporation.—A Checkered History.—Mining Low-Grade Tin Mine.

I referred last week to the curious case of the Boston Consolidated having to issue new debentures to the tune of a quarter of a million pounds in spite of the announcement made a few months before, that the company would shortly redeem the balance of the then existing debenture debt, and I mentioned that English shareholders were left utterly in the dark as to the change in the financial position of the company which necessitated such an entire reversal of the intentions and policy of the board. Another somewhat similar case has occurred this week. The announcement of the result of the half-year's working at the Mount Lyell in Tasmania is just as ambiguous and incomplete as the statements of the Boston Consolidated directors. The result for the six months ended September 30 is given as follows: "The net profit was £128,728, as against £264,935 for the previous half-year, and the lower profit is due to the fall in the price of copper from £105 to £64 per ton. The average price for copper sold was £96 15s. 6d. per ton." There is obviously a contradiction in this statement. The directors say that the serious drop in profits is due to the drop in copper, yet they also say that the average price obtained was £96 15s. 6d. The English investors are quite non-plussed. The real facts of the case are that, though production did not fall off, yet the sales of copper were curtailed very seriously. The average price obtained was given correctly, but the directors failed to state that only two-thirds of the output was sold. It must be remembered that, though smelting is done at Mount Lyell, the refining is done at Baltimore and the products disposed of in America. As in the case of the Boston Consolidated, the American selling agents either cannot or will not dispose of the copper. Everybody has a different idea of the true inwardness of the present copper slump, and it is not for me to presume to understand the internal workings of the selling agents in America. I simply give this as an example of the way in which English investors in a Tasmanian mine disposing of its products in America get doubly cut off from understanding the course of their business. For myself, I never quite understood why the Mount Lyell does not refine its own product, and so become masters of the output, or even why the company does not ship the bessemer bars to South Wales where there are refineries ready and willing to take such business. No doubt Baltimore quotes a lower price, but the Mount Lyell has already lost, by being under the shadow of the American copper market, a larger amount than it has saved.

Some interesting figures relating to operations and costs are given in the report of the Simmer & Jack Proprietary Mines for the year ended June 30 last. This is one of the largest of the mines on the Rand and is the chief asset of the Gold Fields group. The total ore raised was 881,796 tons, of which 165,117 tons were sorted out and 716,679 tons sent to the mill. The full mill of 320 stamps ran for 352 days and crushed 717,524 tons, being an average duty of 6½ tons per stamp per day. The production of gold in the stamp-mill was 165,810 oz. fine. In the cyanide plant, 535,966 tons of sand yielded 92,569 oz. and 181,558 tons of slime produced 14,110 oz. The treatment of by-products produced 217 oz. The total yield was therefore 273,699 fine ounces, valued at

£1,153,719. The total yield per ton crushed was 7.629 dwt., valued at £1 12s. 2d. The working expenses were £694,506, or at the rate of 19s. 4d. per ton crushed. This was a reduction of 1s. 8d. per ton compared with last year. The amount treated in the previous year was 626,507 tons, yielding 236,444 oz., the duty per stamp per day being 5½ tons. The working profit for the year ended June 30 last was £503,132, which is £129,882 more than in the previous year. The improvement in the results is attributed to the increase in the efficiency of Chinese labor, and the directors are chagrined by the fact that they will now have to discard this labor and look for substitutes. In order to place themselves in a financial position strong enough to hunt up substitutes, only £300,000 is being distributed out of the year's profits and the remainder carried forward. The company has recently installed four tube-mills and contemplates rearranging the slime-plant.

It is probable that before long the smelting plant of the Australian Smelting Corporation at Port Kembla,



New South Wales, will be ready for operation. It has been built for the express purpose of treating lead concentrates obtained at Broken Hill. The history of the company, though short, has been a checkered one. It is really a sort of revival of the old Smelting Company of Australia, which itself had many ups and downs and a queer history altogether. But it is not necessary now to revive these old memories; I shall deal with the more recent events. When Bewick, Moreing & Co. went into the Broken Hill business some two years ago in connection specially with the extraction of zinc from the dumps, they decided also to treat the lead concentrate produced by the Zinc Corporation, and for this purpose negotiated for the plant and other assets of the Smelting Company of Australia, which was then in the hands of a receiver representing the debenture holders, and the Australian Smelting Corporation was formed for this purpose. Nothing but dreary disappointments were in store for the directors of this corporation, and I fancy that if these could have been anticipated, the directors would have decided to start an entirely new works. In the first place, it was found that the debenture holders in the old company were not unanimous in their agreement to accept debentures in the new company in exchange for their holdings. A minority held out against fulfilling the contract and the parties went to law. After spending

some five thousand pounds in this expensive luxury, an agreement was arrived at whereby the minority was bought out for cash. A second and more troublesome difficulty arose when it was found that one cause for the old company's failure was the unsuitability of the site of the works, and it was ultimately decided to move them a few miles to the eastward of Dapto, where a more convenient position on the sea-board could be obtained. Then it was found that the company could not afford to provide port facilities and a deputation waited on the New South Wales Government to urge them to do the work out of the public funds. This point was eventually won and the company became at last in a position to complete the transaction and remove the works. This is now being done, and before many months smelting operations will begin. In the meantime, however, some more working capital will be required. Originally £140,000 capital was subscribed in cash, but no less than £52,890 has been spent in preliminary expenses and getting rid of the recalcitrant debenture holders, while another £30,000 or so has been spent in moving the works and other current expenses. A scheme will shortly be placed before shareholders for the raising of further funds.

The Anchor tin mine in Tasmania is well known as an example of the cheap working of low-grade ores; in fact, it mines the lowest-grade tin ore in the world, the metallic contents recovered being between two and three pounds per ton of rock crushed. Hitherto the income has not quite come up to the expenditure. However, during the year July 1, 1906, to June 30, 1907, the high price of tin enabled the company to make a profit. The average price of the tin sold was £161 per ton, and the cost of production including every possible item, during the year named, was £133 per ton. During the twelve months, 153,738 tons of ore were treated and 225 tons of black tin assaying 71% were recovered. This works out at 3.28 of black tin per ton, as compared with 3.40, 3.59, and 3.97 lb. in immediately preceding years. The average number of stamps running was 87½ and the ore crushed per stamp per 24 hours was 5.85 tons. This stamp-duty was a considerable increase on previous years, comparing with 5.26, 4.98, and 4.74 tons. The total income from tin sold for the year was £30,417, and the total expenditure including smelting at Mt. Bischoff, was £21,525. London office expenses came to £1,062, and debenture interest £1,875, so that there was about £5,000 profit on the year's working. Some interesting alterations have been made during the year in the dressing plant, Wilfleys being put in, displacing the old jigs and vanners.

Butte, Montana.

Effect of Amalgamated Shut-Down.—Re-opening of Boston & Montana Mines.—Pittsburg Failure Affects Butte Mines.—Butte & Bacorn Co.—Cable Consolidated.—Davis-Daly Estates.

During the past week the shut-down of all the mines of the Amalgamated Copper Co., with the exception of those of the Boston & Montana, was made complete, and the suspension promises to be for a long time. The big Washoe smelter, at Anaconda, is gradually being cleaned up for closing, and the North Butte and Butte Coalition companies are left without smelting facilities. The position of the two latter, in their relation to the Amalgamated, is puzzling to the public and to stockholders. It is evident that the directors of the North Butte and Coalition are either in full sympathy with the Amalgamated in its policy, and are willing to suffer loss for their stockholders, or the two companies do not have contracts with the Washoe smelter such as give them any protection

against an indefinite shut-down. Both the North Butte and Coalition mines are shut down. While all the hill mines are closed, those of the Boston & Montana Co. are increasing their output and all the ore is being shipped to Great Falls for treatment. The Boston & Montana mines are being re-opened, and as the men are laid off at the other Amalgamated mines they are given cards to the Boston & Montana and put to work there. The Leonard and West Colusa mines, which had been closed for three months or more on account of fire in those properties, are being re-opened, the fire having been bulkheaded and put under control on all levels but two or three. Prior to the shut-down of the Anaconda hill mines the Boston & Montana confined its mining to the Mountain View, East Colusa, and a portion of the Pennsylvania mine. It is the intention of the company gradually to increase the output of all mines until the capacity of the Great Falls smelter, which is about 4,000 tons per day, is reached. The Mountain View production is being increased from 700 to about 1,400 tons per day, the Pennsylvania from 400 to 1,100, and the East Colusa from 200 to 300, while it is expected to get about 400 tons from each of the Leonard and West Colusa. The mining in the Leonard will be done at the east end, in new stopes on the 1,200, 1,300, 1,000, and probably on the 500 and 600-ft. levels. There will be no mining for some time yet on the 700, 800, and 900-ft. levels. In the West Colusa mining will be done in the West end on the 300, 400, 800, and 900-ft. levels. Only Boston & Montana ore will be mined under the new arrangement. At the other Amalgamated mines a number of men are retained as watchmen, to do repair work, and keep the pumps working. From 30 to 40 men are thus employed at the closed mines. The North Butte and Butte Coalition companies are keeping up development work.

The failure of Whitney & Stephenson, the big brokerage firm of Pittsburg, was chiefly responsible for the suspension of development work by the Butte & Bacorn Co., north of Butte, though some other causes contributed to it. The Pittsburg firm was agent for the company in the collection of subscriptions, and when it failed the collections ceased. It is understood that Whitney & Stephenson had very little money on hand belonging to the company at the time of the failure, and that a large sum of subscriptions remained uncollected. Mr. Whitney was personally much interested in Butte & Bacorn, believing that it would in time develop into a great copper mine, which it has all indications of doing. At the time the company stopped work it was testing a very promising vein northeast from the north cross-cut of the Calumet shaft, although the vein is entirely outside the Calumet ground, being explored through the Zuez and Silver State claims, a little southeast of the Berlin shaft. It is understood that all the money the company will need for development work has been pledged by Pittsburg men, and that much more is available, or will be as soon as there is a relaxation of the money stringency. Pittsburg appears to be hit harder than any other community. Fred. W. Bacorn, president of the Butte & Bacorn Co., has gone to Pittsburg to look into the situation there.

The Cable Consolidated Mining Co., which is operating the Cable mines, some distance above Anaconda, has also been compelled to suspend operations on account of Pittsburg financial troubles, as the company had all its funds in the Fort Pitt National Bank, which has failed. For some time the Cable mines yielded enough copper ore to pay all expenses of mining and development, during its exploration of the gold veins in the property, but when the smelters ceased purchasing copper ore the company had to fall back upon its treasury for development funds. The failure of the Pittsburg bank shut off that supply.

The report from Pittsburg is that the bank will be able to pay up in full and that the Cable funds are safe. The suspension of the Reins Copper Co. was also mainly due to the extreme tightness of money in Pittsburg.

F. Augustus Heinze has retired, or has been retired, from both the Silver Bow National Bank and the State Savings Bank in Butte, both of which he controlled up to the time of his financial troubles. It is announced that he sold his interests voluntarily, as being for the best interests of the stockholders of the banks. The publication of the fact that the treasury of the Davis-Daly Estates Copper Co. had been provided with but \$500,000 upon the organization and flotation of the company instead of \$2,000,000, which the public had been led to believe had been put in the treasury, has added to the further surprise of stockholders. It is promised, however, that the remainder of the fund will be provided by the vendors as soon as money conditions improve, and that development work on the properties in Butte will be resumed.

Toronto, Canada.

The Question of Smelters.—Operations at Cobalt.—Ore Shipments.—Report of Coniagas.—Several Strikes.—Wild-Cat Exposures.

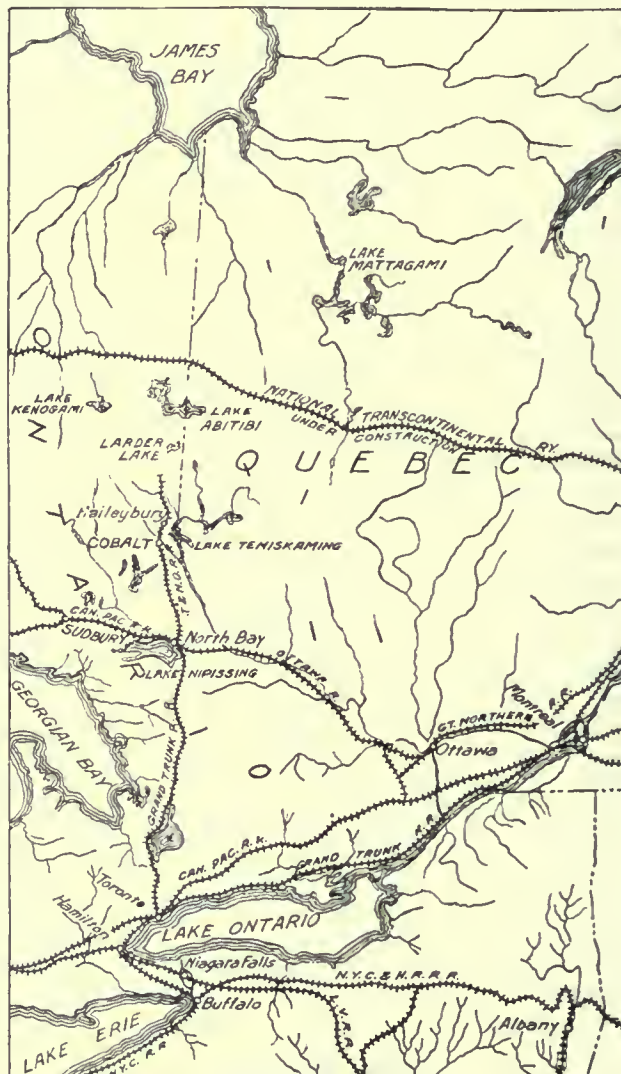
The smelter difficulty continues to be the dominant factor in the Cobalt situation. While the output goes on steadily increasing, and the leading mines establishing their position as producers more firmly, stocks remain at, or fall below, the level to which they were forced by the Wall Street crisis, with no apparent indication of improvement. The sole cause appears to be the difficulty of disposing of the ore on satisfactory terms. Last week's shipments, though from two mines only, established a new record.

The La Rose shipped 497 tons and the Temiskaming 30 tons, the whole of the La Rose consignment going to the smelters at Denver. The New Jersey smelters offer to take ore, and, instead of paying for the silver less expenses of reduction, to return the bullion. This is regarded as unsatisfactory by the mine-owners. The Copper Cliff smelter, owned by the Orford Copper Co., is in the market for ore, and will pay on a graded scale from 94 to 80% of the silver content, according to the grade of ore. To command the highest price the ore must assay 4,000 oz. silver per ton, or over. Payments are to be made in two installments in 45 and 90 days respectively from the date of sampling, and the company reserves the right to pay in silver bullion delivered in New York instead of cash. The payments will be according to the New York price for silver at the date of settlement.

A careful calculation of the number of men now employed in 35 mines in the Cobalt district gives a total of 1,846. Several other mines some distance out are also being worked, and these will easily bring the number up to an aggregate of over 2,000. Shipments continue to increase in volume in spite of the difficulty with the smelters, the total for the week ending Nov. 30 being 956 tons, from the following mines: Foster, 49 tons; Hudson Bay, 67; Kerr Lake (Jacobs), 22; La Rose, 632; Nova Scotia, 46; Silver Queen, 60; Tretheway, 26; Townsite, 21; and Temiskaming, 31 tons.—The Abitibi & Cobalt Mining Co. and the Empress Co. have been merged in a new organization to be known as the Cobalt Majestic Silver Mines, Ltd., in which British capital is largely interested. This company has also acquired a promising native silver location in James township. Abitibi stockholders will receive share for share in the new concern.—A satisfactory showing was presented at the annual meeting of the Coniagas Mines, Ltd., on Nov. 30. The directors' report, covering a period of 11

months ending Oct. 31, showed gross returns of \$779,225, and working and organization expenses \$154,533, making the net returns \$624,762. Dividends and a bonus amounting in all to \$300,000 had been paid, leaving a balance of \$324,762. Ore on the dump was estimated at \$100,000, after deducting cost of concentration and treatment. It was announced that a shaft had recently been sunk to a depth of 60 ft. under the 75-ft. level, the ore at that depth being equal to any yet encountered.—A vein of high-grade ore has been struck in the Foster.—A strike is reported on the 100-ft. level of the McKinley-Darragh mine in Bucke township, consisting of smaltite carrying silver.

As a result of recent exposures of wild-cat operations, a Shareholders' Protective Association is being organized



A Part of Ontario, Canada.

as a medium through which investors in mining and other companies that have raised money by the flotation of stock can investigate their affairs. The association will endeavor to ascertain the facts where companies have failed to comply with the law respecting prospectuses, or resorted to misrepresentations in the sale of shares, and will adopt means for the recovery of moneys so received.—The Toronto and Cobalt branches of the Canadian Mining Institute have nominated Willet G. Miller, Ontario Provincial Geologist, for the presidency, and Alfred E. Barlow for the vice-presidency.

The trial of the charge of conspiracy to defraud against Frank Law and W. Lockhart Russell in connection with the flotation of the Highland Mary Mining Co. has been adjourned from time to time pending the return of Russell from Enrope.

Cripple Creek, Colorado.

El Paso Affairs.—The Drainage Adit.—Sound Banking Conditions.—November Production.—Strike in the Rigi.—Another Cyanide Mill.—The Findley Resumes.—Prospecting on Big Bull Mtn.

The interest of the public for the past week or ten days has been centred on the affairs of the El Paso Co. by reason of the peculiar method of letting blocks of ground under the leasing system recently adopted; the 25 blocks, under graded royalties, are to be let to the highest bidders, which is a condition without precedent in the camp. Another feature of interest has been James F. Burns' objections to the leasing system under any conditions, and the driving of the drainage adit by the El Paso Co. for the reason that the contract, as he contends, is without charter rights. Mr. Burns is the largest individual stockholder, but has not been able to sway the action of the directors, who, in spite of his protest, have instituted the leasing system and resolved on pushing the adit to completion if a modification of contract terms is obtained. However, the Drainage Tunnel Co. at a meeting of the board of directors has declared the contract forfeited, as the El Paso Co. has not been able to make the requisite number of feet per month. The Drainage Tunnel Co. will continue the driving of the adit on its own account.

The banks of the Cripple Creek district were the last to use measures of restriction in regard to cash payments and are the first to remove them, resuming payments Dec. 14 as before the situation became unsettled. The business men and public generally, understanding the soundness of the banks under normal conditions, have done everything possible to restore confidence as shown by deposits and absence of withdrawals. The ability to convert the gold of the district into gold coin to meet pay-rolls and other immediate needs is a large factor in this connection, an advantage at the disposal of very few communities.

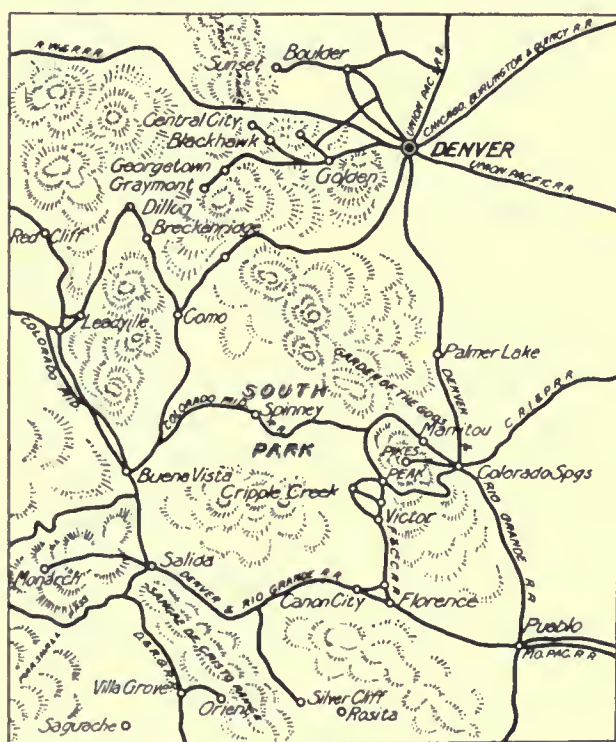
The gross production of gold for November passed the million dollar mark, the amount being \$1,099,050, an increase of \$121,000 over October. The average value of ore treated by the U. S. R. & R. Co. was \$27 per ton or \$4 higher than for the preceding month. In gross tonnage the smelters reported a loss, but with an increased value, while the Portland mill and several smaller plants gained both in tonnage and value. The total tonnage for November was 47,300 tons and considering that the Golden Cycle mill treated 24,800 tons in October and nothing in November, the improvement is most pronounced, and with the Golden Cycle mill in operation within a few days, December is expected to be the banner month of the year. The railroads having all they can handle with no prospect of a cessation of activity.

The Mabel M. mine, on the east slope of Beacon hill, is reported to have a rich orebody in the Husted workings on the 300-ft. level, being discovered at the junction of two veins in a drift south from the shaft; assays as high as 52 oz. are being obtained. This property is under lease to the Union Leasing Co.—A strike in the Rigi property, just east of the Portland on Battle Mtn., is reported, assays ranging from \$50 to \$145 in gold per ton; a trial shipment has been made, and returns of 2½ oz. per ton are expected.—A cyanide plant for the Blue Bird property is reported to be in contemplation, to cost \$12,000; there are between 50,000 and 100,000 tons of low-grade ore on the dump assaying from \$3 to \$8 per ton; also large bodies of low-grade ore in the upper workings of the mine.

Harrison & Seaver, former lessees on the W. P. H. property, have secured a lease on the entire workings of the Teutonic mine adjoining the W. P. H. Develop-

ment work in the upper workings is all that is planned for the present.—The Findley mine on Bull hill has resumed operations after being closed down for several months; one shift of 160 men is the extent of the activity at present, but it will be increased when the Golden Cycle mill is in full operation. There are several thousand tons of ore ready for shipment from the 1000 and 1100-ft. levels, where there are two large ore-shoots on which development work is being carried forward.—The Carbonate Queen mine on the west slope of Squaw Mtn. is making a bid to become an important producer. After a great deal of development work a 4-ft. vein has been broken into on the 500-ft. level, and several assays show \$500 per ton or better. Should this orebody prove persistent, as it is the largest yet found on Squaw Mtn., that region and Battle Mtn. adjoining will experience a stimulus in prospecting.

With company account and lessees the Anaconda and Mary McKinney estate produced a gross tonnage of between 1300 and 1400 tons of ore for November, with an average value of better than 2 oz. per ton. All the work



A Part of Colorado.

is conducted above the 700-ft. level owing to water below that point. The Pressler and Smith & Altman leases produce the greatest tonnage on lessee account.—The Western Investment Co. reports cutting the extension of the rich ore-shoot from which the British-American Co. has made such profitable shipments.—The Mohican mine, situated between the Ajax and Gold Coin mines on Battle Mtn., has been leased to C. L. Amsden and brother, of Victor, for two years with 25% flat royalty.

The rich orebody opened some time ago in the Old Gold continues to hold out well; the tonnage is not great, about a car a week being sent out; however, the ore runs high, \$50 per ton in bulk is reported, while some free gold-bearing quartz in the centre of the ore is saved separate from the rest of the vein, which is 2 to 3 ft. wide, and seems to be an extension of the C. K. & N. vein, which produced more than \$500,000.—The Golden Cycle Co. owns a great deal of ground on Big Bull Mtn., but no large amount of development work has been done in this part of the district. It is reported that the main shaft will be sunk another 100 ft., or to a depth of 1300 ft., from whence a cross-cut may be run east to explore Big Bull at depth.

Salt Lake, Utah.

Smoke Troubles and Blackmail. — Zinc Ores. — Lower Wages at Bingham. — An Oil Excitement. — License Tax.

There is a strong probability that the Utah Consolidated will close its smelter at Murray and will cease production pending the construction of a new smelter in Tooele county, unless arrangements are made in the meantime to ship the product of the mine to some custom smelter. The farmers of the Salt Lake valley who appeared as plaintiffs in the smoke case, which resulted in the decree of injunction, were approached on the matter of allowing a continuation of operations until March, 1909. They spoke favorably—but their concession had a string attached to it—that of demanding a bonus of \$200,000, in addition to the company being made subject to any damage that might come through the action of fumes upon the farms. In other words, it would cost the Utah Consolidated company practically \$300,000 for the privilege of operating its smelter another 15 months. It is believed here that the proposition will be rejected by the directors and that the fires will be drawn in the near future. The Bingham Consolidated plant is practically down and there is nothing to indicate that the United States can escape the operation of the Court's injunction on January 6. Regarding the lead smelters, there are good reasons to believe that they will continue in operation, as they have made terms with the farmers of the Salt Lake valley.

The miners of Bingham have accepted a lower scale of wages, to take effect on January 1, with good grace. A vote taken at a recent meeting of the miners' union resulted unanimously in favor of the reduction, which amounts to about 25 cents per day. The Bingham scale is called automatic for the reason that should the market price of copper go back to 18c. per lb. again, the present rate will be in vogue.

Much interest is being taken in the Virgin Oil district in southwestern Utah and there is every indication that the field is going to prove to be a meritorious one. Sixteen rigs have been set up and nearly all of them are in operation. Several others are on the way. Southern California capital is largely interested in these ventures.

The directors of the Nevada Hills Mining Co. have posted a dividend of 10 cents per share, or \$100,000, making a total of \$375,000 for the year. The Nevada Hills operates at Fairview, Nevada, but the headquarters of the organization are in this city.

The year has broken all previous records in the disbursement of dividends. A total of \$5,373,992 has been paid out to shareholders of Utah mining companies, not counting what has been received by shareholders of the United States Smelting, Refining & Mining, and the American Smelting & Refining companies, which derive no small part of their earnings from their respective enterprises in this State. But the mines contributing the sum stated are: Beck Tunnel Consolidated, \$340,000; Bingham New Haven, \$22,896; Bullion Beck, \$30,000; Century, \$6,000; Colorado, \$620,000; Columbns Consolidated, \$212,623; Daly Judge, \$225,000; Daly West, \$378,000; Eureka Hill, \$100,000; Gemini, \$100,000; Grand Central, \$147,500; Horn Silver, \$60,000; Lower Mammoth, \$57,000; Mammoth, \$80,000; May Day, \$64,000; Newhouse, \$300,000; Silver King, \$375,000; Swansea, \$5,000; Uncle Sam Consolidated, \$70,000; Utah, \$36,000; Utah Consolidated, \$2,100,000; Victoria, \$30,000; Yankee Consolidated, \$15,000. Last year, the total dividends paid amounted to \$4,163,137, leaving a balance in favor of 1907 of considerably more than \$1,000,000.

Torreon, Mexico.

The Lustre Co.—Torreon Smelter.—The Velardena Smelter and Mines.—A Modern Equipment.—American-Mexico Mining Co.—The Mazapil Copper Company.

The smelting plant of the Lustre Mining Co., at Magistral, in Durango, has two furnaces in operation, and a third furnace is being installed which will be blown in about January 1, 1908. This will give the company the capacity to smelt 500 tons per day. The ore is hoisted and conveyed to the feed-floor of the smelter over a surface tramway. The ores carry from 15 to 20 grams gold and less than 1% copper, being sulphide and oxidized ore in a quartz and lime gangue. Electric power, generated by wood-gas engines, is employed in operating the hoist, blowers, and pumps. R. W. Bissell is general manager, with F. B. Hine as superintendent of the smelter. Magistral is 60 miles south of Rosario, the latter being the terminus of the Parral branch of the Mexican Central railroad.

The Torreon smelter, operated by the Torreon Metallurgical Co., has seven lead furnaces and one copper furnace in operation. The plant handles an average of 1,000 tons of charge per day. The furnaces are all 44 by 144 inches. The charge is fed from mechanical charging cars that pass directly over the furnaces, the feed being distributed by spreaders. Eight reverberatory roasters are employed in treating the lead matte, which contains from 10 to 15% lead. The partially desulphurized matte is then re-smelted. The blast is supplied by five No. 8 and two No. 7 blowers; the intention is to install an additional blower. There are about 4,000 ft. of dust-flues between the blast-furnaces and the main stack. The briquetting plant is of the Henry Moules type. The water supply is derived from wells in the vicinity of the plant. The volume used per day for the jackets and sprinkling is about 1,500,000 gal. Ernesto Madero is general manager of this company, N. Villareal being assistant manager; E. Harms and C. A. Heberlein are superintendent and assistant superintendent, respectively. While this company operates several mines of its own, its plant is largely a custom smelter. Mr. Harms states that there is a great abundance of ore, and there seems to be no falling off of the custom supply.

The American Smelters Securities Co. has taken over the mines and smelter at Velardena, formerly operated by the Velardena M. & S. Co. The smelting plant, which was completed about a year ago, is situated four miles from Pedricena station on the National railroad that extends from Torreon to Durango. The mines are in the vicinity of the old town of Velardena, situated two miles from the smelter site. This company has its own railroad line, running from its smelter to its various mines, aggregating some 20 miles. The Mexican National also operates a branch road between the Pedricena station and Velardena. The mines comprise the Santa Maria group, at Velardena; the San Lorenzo group, in the near-by San Lorenzo range; and the Copper Queen group, 27 kilometres by rail from Velardena. The Santa Maria mines are opened by numerous shafts; they produce between 500 and 600 tons of silver-lead ore per day, a part of which is concentrated at the company's Velardena mill. The mines of the San Lorenzo group comprise the Terneras, La Chona, Los Bancos, and others. These are worked through adits and shafts. The Terneras adit, provided with electric haulage, is about 300 ft. long. The workings extending from this adit are very extensive. These mines likewise produce a silver-lead ore, which is conveyed from the Terneras adit to the bins at Velardena over an aerial tramway.

The Copper Queen, as the name implies, is a copper property in the main, though producing a good deal of silver and lead. There are extensive bodies of oxidized ores here. The mine force at all these mines has lately been much reduced, because, it is stated, the smelting plant has been receiving more ore than it could handle. Wm. Davey is superintendent of the mines. The company has a power-plant at Velardena, equipped with boilers and gas-producers. At present the main electric generators are steam-driven. In the plant, however, are several Crossley gas-engines supplied with fuel from the gas-producers, and they also operate electric generators and compressors.

The smelting plant is considered one of the most modern in Mexico. It is under the general superintendency of Wm. J. Hamilton, who has like supervision over other Mexican plants of this company. There are three

conveyors running to it the material is distributed as required in these great bins. Charge-cars are passed under each bin and loaded automatically. The extensive dust-chambers and flues terminate at the base of a 230-ft. brick stack. The flue-dust and fine are briquetted in the usual manner. The copper matte produced here is shipped to the same company's converters at Aguascalientes, there being no copper converters at the Velardena plant. This smelter is operating at full capacity. The company has excellent outside buildings, affording residences and rooms for employees.

The American-Mexico Mining & Developing Co., under the general management of F. O. Smolt, has three mining properties in the San Lorenzo range, near Velardena. They are known as the Le Roca, Los Libres, and Tecolotes. The Le Roca has a narrow vein in diorite, carrying gold, silver, and copper ore. About 100 tons per



Map of Mexico.

lead furnaces, of a capacity of 150 tons each; and three copper furnaces of 200 to 250 tons each; and the plan is to install one additional furnace soon. There is a roasting plant, consisting of 5 Godfrey roasters and 10 Huntington-Heberlein converters, for desulphurizing the lead sulphides. The crude ore and concentrate are fed to the roasters, and the calcined product is then fed to the converters, which under strong blast reduces the sulphur to about 5%; the product of the converting pots is partly fused together in a matte-like form. The capacity of the roasting plant is about 125 tons per day. This material is conveyed to the charging floor and mixed with the oxidized ores and briquettes that go to the furnaces. Each blast-furnace has an elliptical double-brick-lined settler, 4 by 12 ft., inside measurement. The slag is handled in 10-ton slag-cars, pulled by electric locomotives. The charge is fed into the furnaces automatically from charging cars hauled to the feed-floor by electric locomotives. The sampling plant, and the system of conveying the ore from the sampler to the 12 charge-bins, of 3,000 tons capacity each, is of the most modern and complete type. Over the bins referred to is an electrically operated portable steel bridge, and by means of

month were mined in 1905. The Los Libres produces gold, silver, and lead ores, quite silicious, occurring as deposits in limestone. A considerable tonnage has been produced. The Tecolotes is 6 miles north of Velardena, and produces an arsenical ore, carrying lead, gold, and silver. This company has a two-furnace smelting plant near Velardena—one copper and one lead furnace. It was erected in 1904-5. It was operated during the latter half of 1905, and a part of 1906, but it is idle at present. M. W. Sheafe, of Watertown, South Dakota, is president of the company.

The Mazapil Copper Co., which is operating both copper and lead mines at Concepcion del Oro, State of Zacatecas, has a copper smelting plant of three furnaces at Concepcion, and a lead smelter of two furnaces at Saltillo, both of which are active. The company employs 7,000 men, and its annual production is approximately as follows: Metallic copper in matte, 3,700 tons; lead, 7,000 tons; silver, 1,200,000 oz.; gold, 10,000 oz. This company owns the narrow-gauge railroad extending from Saltillo to Concepcion, distance about 80 miles. P. E. O. Carr has just taken the general management of the company, with offices at Saltillo.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

A BELT CONVEYOR does not operate satisfactorily on an angle much greater than 20° ; this is due to the fact that the ore will not stick to the belt. When the grade is steep the rollers supporting the belt must be placed close together to prevent bumping of the ore as the belt passes over the rollers.

If the company fails to perform the necessary annual work to protect its unpatented mining property from re-location, a stockholder may perform it and recover therefor from the company. Work done by such stockholder for that purpose is legal and valid and will preserve the property from re-location.

RESUEING consists in blasting the waste and cleaning that away before the ore is blasted. When machine-drilling is used, the holes in the waste and the ore are drilled from the same set-up; when hand-drilling is used, the waste is drilled and blasted before the ore is drilled. Resue is sometimes improperly called desue.

AT the end of a shift it is customary to hang the cages even with the collar of the shaft; this is to prevent objects or persons from falling down a shaft. It is a poor policy for it greatly hinders the natural ventilation of the mine. A guard rail is generally sufficient, but a gate can easily be made to be used for guarding the shaft when hoisting has stopped.

VENTILATION CONDITIONS in metal mines can be judged fairly well by the amount of carbon dioxide in the air; generally there is a relation between the percentage of carbon dioxide and that of the other more injurious components of mine air. In Western Australia the law limits the percentage of carbon dioxide, permissible in mine air, to 1.5 parts per 1,000.

ON THE RAND generally one white man and five Kaffirs run two air-drills; in some cases one white man and seven Kaffirs run three drills. Eight 6-ft. holes is considered a shift's work for two machines; these holes break on an average two fathoms of ground. The cost is as follows: One white man, £1 5s.; five Kaffirs, 15s.; powder for two machines, 16s.; maintenance, 4s.; total, £3, or \$14.55 per fathom.

THE object of pooling stock is usually defined in the agreement. Sometimes it is to create or consolidate the voting power of the stock, thus perpetuating control of a given faction, and is then called a 'voting trust.' More frequently its object is to prevent vendors' or promoters' stock from coming into competition on the market with treasury stock, or promoters' stock competing with vendors'. It is difficult to infer the object without full knowledge of all the circumstances.

DIRECTORS have no power to deal with the stock of the company's stockholders. The company has no interest in its issued stock and cannot bind the stockholders through the action of its directors. A pool of the stock formed, or continued, by order of directors, is of no legal force, and the stockholder is entitled to the delivery of his stock out of the pool. In fact, there are but few pooling agreements, even if made by stockholders, which may not be repudiated or broken by any of the parties to it. Many of them are illegal and contrary to public policy.

THE important saving that can be accomplished by close sorting of ore containing much waste is shown by the following costs, taken from the reports of the Jumpers Gold M. Co. (Transvaal): For year ending July, 1906, sorting 17 to 18%; recovery per ton, 32s. 11d.; working costs per ton, 23s. 9d.; profit per ton, 8s. 2d. For quarter ending October, 1906, sorting, 22%; recovery, 39s. 6d.; working costs, 27s.; profit, 12s. 6d. For November, 1906, sorting, 22%; recovery, 40s. 6d.; working costs, 27s. 6d.; profits, 12s. 6d. For December, 1906, sorting, 38%; recovery, 44s. 7d.; working costs, 30s. 9d.; profit, 13s. 10d. Of the 38% sorted, 20% was sorted in the stopes and 18% at surface.

THE president, or secretary, or the general manager of a company, are officers to whom a stockholder has a right to apply for information as to the condition of corporate affairs. While the extent of privileges to which stockholders are entitled depends somewhat upon the law of the State under which the company is organized, or where its business is carried on, it is a general rule that where the officers of the company refuse to comply with a reasonable request of a stockholder for information, such stockholder has a right to demand an inspection of the books of the company, and this right may be enforced by the courts. Frequently the law provides a penalty for the refusal of such reasonable requests.

THE INCrustING ACTION of hydrous calcium sulphate in the cyanide solutions passed through filter-presses has caused considerable trouble where sulphide ores are roasted before being treated with cyanide. The removal of this incrustation from the plates of the filter-press is quite expensive. Pneumatic tools and 'sand-blasts' have been used in cleaning these; the latter is the cheaper and the more effective of the two when the plates are badly incrustated. This costs about \$4.80 per plate besides the cost of removing and replacing the plates. At the Great Boulder Main Reef mill, A. Wauchope has constructed a furnace in which these filter-plates are baked at a low temperature for 24 hours. This de-hydrates the gypsum, and then it can be easily removed with brushes made from stout steel rope. The total cost of removing, cleaning, and replacing the filter-plates was by this method about \$2.50 per plate.

TO GEORGE F. BECKER we owe the following formula regarding interstitial space in sediments. When a space is filled with spheres of equal diameters but of such size that each sphere will be in contact with 12 others, then, no matter what the diameter of the spheres may be within these limits, the interstitial space bears the following constant ratio to the whole space:

$$1 - \frac{\pi}{3\sqrt{2}} : 1, \text{ or } 25.95\%.$$

In the case of sandstone most of the open space between the component grains is unfilled and this formula was found by George F. Becker, and still later by C. R. Van Hise, to be approximately correct. In the case of conglomerates much of the interstitial space between pebbles is filled with sand and silt so that the above formula is not applicable. Assuming that the conglomerate were composed of spheres fulfilling the above requirements, and that the interstitial spaces between these larger pebbles were filled with smaller spherical pebbles, whose size also agrees with the requirements of the above formula, then the ratio of the interstitial space to the whole volume would be as

$$\left(1 - \frac{\pi}{3\sqrt{2}}\right)^2 : 1;$$

in other words, the interstitial space would be only 6.73% of the whole space.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

Capitalization of Rand Mines.

The Editor:

Sir—In your issue of November 2, Thos. H. Leggett says that the Rand mining companies are not over-capitalized, and uses as an argument the fact that certain companies return high rates of interest on the nominal capital. The nominal capital means very little, as most of the mines on the Rand have raised their cash capital at high premiums, and it is on this capital that interest must be paid. The Witwatersrand Deep, for example, raised part of its working capital at 50s. per share and part at 80s., and the dividend of 40% on the nominal capital means only 10% to those who paid 80s. for their shares. So with the Robinson Central Deep; working capital shares have been issued at 85; the dividend of 75s. on the nominal is really only 17½% on the paid-up capital. I do not know what the Rand Mines sold their working capital shares for, but I know that the 5s. shares were as high as £13 in the market in 1902 and are now about £5. The dividend of 120% or 6s. per share, not 180%, is only 6% on the present price. These are, I think, favorable examples of Rand mining companies. Mr. Reyersbach, in giving evidence before the Commission on the Mining Industry, now sitting at Johannesburg, showed that, in 1906, 39 companies paid dividends averaging only 3%, after allowing for amortization of capital, on the market valuation of the shares. It is largely due to the fact that the Rand mining companies yield such low returns as a whole that fresh capital for new ventures is hard to raise.

W. FISCHER WILKINSON.

London, November 27.

Thawing Dynamite.

The Editor:

Sir—In regard to the thawing of dynamite, the clipping herewith, taken from a prominent Spokane daily, may possibly convey to your readers some facts which are new to them:

"Joseph Plastino, one of the contractors, accompanied the injured men to Spokane. In telling of the accident he said: 'When the dynamite is frozen the men always put it over a fire and thaw it out. When it catches fire, it blazes up like a roman candle. The men had gone back to their work, when they saw the dynamite blazing and ran over to the fire to put it out. They can usually do so by pulling it away from the fire and smothering the blazing portion of it. The foreman of the gang saw that the men could not get there in time to save the dynamite and started toward them to tell them to get away from it. He yelled at them, and just then the explosion occurred. One man was blown all to pieces and the four others were all badly mutilated.'"

Comment is entirely superfluous.

FRANCIS A. THOMSON.

Pullman, Wash., November 21.

[Small quantities of dynamite can be safely thawed by placing it in a small box constructed to set in a box about 16 in. larger than the smaller one. In the open space between the two, green manure is rammed. The top of the box should have a small opening in it leading to the open air. Owing to leakage of dynamite, which may occur, the manure should be changed occasionally. An-

other simple way is to have the dynamite placed on racks near the top of a large box. A can filled with hot water is then placed in the box to supply the heat.

Rules for the Guidance of Employees Underground.

The Editor:

Sir—I venture to suggest the following additions to the rules published in your issue of October 19:

1. No employee, other than the man especially hired therefor, shall carry powder underground in the skip or cage without especial permission.

2. Machine-men and miners shall give a list of the number of drills and tools used by them on each shift to some authorized person, or shall mark same on space provided therefor.

3. Machine-men and miners, before relieving their partners of the preceding shift, shall inquire of the shift-boss for any missed holes, or shall look for list of same on the board provided therefor.

4. Where a station-tender is not employed, there shall be an added number of bells to the regular station-signal to be used by the cage-tender in signaling to raise or lower the cage to any station.

AUGUSTINE LAWRENCE.

El Oro, Mexico, November 10.

A Word for the Miner.

The Editor:

Sir—During the past few months the papers and magazines have been full of references to the trial at Boise, the former troubles in the Cenr d'Alene and in Colorado, and the Western Federation of Miners, and nearly every editor and journalist has taken the opportunity to comment upon the miner and his ways. People who have read these things, and who are not familiar with conditions in mining camps, would be led to believe that the average miner is a most undesirable sort of man, drawing high wages, working short hours, and leading a free irresponsible sort of a life. While no one can excuse the lawless outbreaks that have occurred, it is only fair to the miner to state that his path is not strewn with roses, and often the mining companies are not entirely blameless. You hear of an outbreak, or act of open violence committed by the miners, but you do not hear of the thousand discomforts, annoyances, and exactions that have gone before; nor is it understood that it is the presence of a few agitators from outside, or at worst, simply a mob spirit, with which any body of active rugged men can be imbued if some few clever men deliberately set about it, that precipitates trouble of this kind.

Leaving aside, however, the whole question of the Federation and its policy, and the inevitable war over the division of profits that must always be waged between capital and labor in the mining camps or wherever a large number of rough free-thinking men, without home or family ties to steady them, and living in a most unsocial way, are employed by a corporation whose principal idea is dividends, and whose policy may be dictated by some far-away office; it is a pity that the conditions under which the average miner lives and works are not better understood. If some of the writers who have been contributing so freely to the papers during the past six months could live with the miner for a couple of years, they might have different ideas, and would certainly feel a little more charity for this class of labor.

But in respect to publicity, as in many others, the miner is either poorly represented, or entirely misrepresented. Of course, there is a physical reason for this, since outside of the fact that the average miner possesses

but little literary education, no man is able to do a hard day's work at manual labor, and then exercise his mental self very much. And the more he develops the physical side and thus becomes more familiar with the miner's side of the question, the less he is apt to write intelligently about it. However, there is an increasing tendency for men with a technical education to go underground, so probably we may expect to hear that side of the question more coherently discussed in the future. Today there are men working in nearly every camp, who could contribute useful accounts of the miners' side of the question, and as the columns of the technical journals are open to them, it seems as though this sort of write-up should be more frequently seen.

The average employee of a mining company can either accept the treatment offered him, or get out. He has no appeal, no chance to be heard; if he takes exception to some arbitrary rule of the management, he gets his time. If he moves to a new camp he meets the same conditions.

Take for example the Cœur d'Alene region in northern Idaho; this is considered a good place to work, but there are a lot of things that are far from ideal. In the first place, to get work there, it is necessary to go through an employment office, maintained by several of the larger companies. Instead of going to the mine foreman for a job, the man must go to Wallace and get a 'letter' before he can go to work. Twice a day he takes his place in a long line and waits his turn to see the head of the employment bureau. When he finally gets into the sanctum sanctorum, the superior being who dominates it gives him a negative grunt or a shake of the head. If he looks pretty husky, he may be told to come back on the morrow. Then he has a day of enforced inactivity on his hands. This may continue for a week, a month, or longer. When he finally does get a chance, he does not go to the mines he wants to work in. If he asks to go to the Tiger, he will probably be sent to the Morning. If he wants to run a machine in the Last Chance, he will be put to tramming in the Standard. Whatever he wants, it seems to be considered good discipline not to give it to him. If he kicks at all, he may as well leave the camp at once, for Jack Bayne never forgets, and his chances at the employment office will thenceforth be slim. Once on the job, his troubles are not over. If unmarried, he must live at the company boarding house, \$1 per day being withheld from his pay for meals, and room charged extra. If married, he will find it best to trade exclusively at the company store. Also he is expected to vote as his boss suggests, stay away from dances given in the Miners' Union hall, and become as nearly as possible, a subservient impersonal being. Regular hospital fees are subtracted from his pay. Monthly payments for insurance are deducted from the amount due him, although if he be single there is no insurance whatever about it and not one cent is paid to anyone if he is killed.

It is a pity that some of the writers who criticise the miners could not go, for instance, to the Standard boarding-house at Mace, and eat the sloppy meals, change in the crowded filthy dry-room, and sleep in the little dirty rooms with two railroad lines running directly under the windows. Working on the night-shift, sleep during the day is impossible. If you retire at 3 A. M. you will be awakened at 5:30 by a husky janitor pounding on your door with a section of rubber hose. All day there is noise, and in the summer, heat and flies. Underground the cry is more work, more muck. It is a strenuous existence, with few diversions. Everybody has heard of Al. Page's boarding-house at Wardner, for the employees of the Last Chance. He is understood to have a life contract with the Federal company, entitling him to the patronage of all the men. During the winter, pneumonia

plays havoc with the men at the Morning, a wet mine. The whole country is dominated by the Federal company. The Tiger Mercantile company, where you are expected to buy your supplies, is owned by Federal officials. The Cœur d'Alene foundry at Wallace is owned by mine managers and superintendents. Every time they O.K. a foundry order they vote money into their own pockets. All mining men in Idaho know of the struggle the owners of the Hercules mine had to keep out of the clutches of the Federal company.

This is the country in which the Bunker Hill & Sullivan mill was blown up. That was the only bad break that has been charged against the men for ten years, it being precipitated by a cut in the already low wage scale at the Bunker Hill mine. If the cumulative injuries that the men have stood at the hands of the companies were balanced against this one, the result might not look bad for the miners. The men working underground here are a good lot. They have had a bad example set them for years by the companies themselves, and they have been stirred up occasionally by professional trouble makers, but on the whole they have taken their medicine quietly, and behaved as well as might be expected.

These things could all be written up in detail. There is no reason why they should not be, and the same is true of every camp. The conditions under which the men work in the Cœur d'Alene are not especially bad. In fact, as I have said before, it is considered a good place to work. Anyhow, there are two sides to all questions, and the miner's side hasn't been given enough prominence in the matter that has recently been written about them.

B. N. W.

Spokane, December 1.

[We are glad to have the case of the working miners stated by one in touch with them.—Editor.]

Diamond Drilling.

The Editor:

Sir—In your issue of Oct. 12, Mr. Lewis T. Wright states in his article on diamond drilling that the average cost of wear on carbons per foot is \$2.25. The writer has had considerable experience in contract drill-work in Colorado, doing in all some 15,000 ft. at a price of \$2 to \$2.50 per ft., furnishing everything but power. Carbons were at this time from \$43 to \$75 per carat, almost the same as at present. The work covered all kinds of rock, from very hard to soft; a great deal of hard fine-grained quartz porphyry and flint being drilled, yet never did the cost of wear on carbons exceed 75c. per ft. About 80% of the holes drilled had to be cased, causing extra reaming, but the average wear on carbons used did not exceed 50c. per ft. Broken up and caving ground is always more expensive than straight hard ground, owing to loss of time (the stones being chipped in the holes) and the reaming necessary to case off the cores. Frequently the high wearing cost on carbons is due to the inferior grade of stones used. The selection of stones is a difficult matter and can only be done properly by one who has had large experience in selecting. The average lots of stones got from the carbon brokers will not give 20% of serviceable carbons, yet all may be, to look at, splendid stones. Hammer testing is the only way to try stones properly, and few men can test them in this way. Under ordinary normal conditions, and with good setters and runners, using first-class stones, the cost of drilling should not exceed \$2.50 per ft. for holes up to 1,000 ft. in depth.

R. B. WEDDLE.

El Cajon, Cal., December 2.

Tube-Mill Lining.

The Editor:

Sir—In your issue of November 23 H. W. Hardinge claims credit for the so-called El Oro liners.

In fairness to him and to all concerned, I can state that the El Oro liner was in use at the El Oro mill at least 18 months before his patent was granted. Lately I have seen mention of the El Oro liners, giving credit for the invention to the Dos Estrellas mill. As I was responsible for their introduction at the Dos Estrellas, I take pleasure in correcting this error.

The rib-liner mentioned was invented by J. R. Brown while in the employ of the El Oro Mining & Railway Co.,



Interior of Tube-Mill.

and was later slightly modified by E. Burt, the present cyanide superintendent of the same company. Said liner has been in use at the El Oro mills for over two years, to my certain knowledge; and about 18 or 20 months since, I had same copied and put into the tube-mill at the Dos Estrellas plant. Other parties in El Oro secured the Mexican patent rights for Mr. Brown's liner, and I believe that still another patent for a ribbed liner has been granted by the Mexican Government.

I enclose a photo of the interior of the tube-mill showing the El Oro liner, taken in January or February of the present year. The fairy story going around that the invention was purely accidental, is, I believe, wholly unfounded. The ribbed liners were made with the idea in view of being able to use the pebbles as liners without the use of cement, and not to give the pebble a longer drop.

C. E. RHODES.

Guanajuato, November 29.

The Editor:

Sir—Referring to your issue of November 23, and to an article by H. W. Hardinge, we beg to say that a reference to the U. S. Patent Office files will show that on June 13, 1906, Joseph Rodney Brown, of Los Angeles, (formerly of El Oro, Mexico), applied for a patent on "lining for grinding mills." The patent was allowed and issued on August 27, 1907, and bears number 864,357.

Three claims were allowed, namely:

1. A lining plate for a tube-mill and recesses therein for holding grinding bodies, said recesses being somewhat wider at the portion adjacent to the axis of said mill than at the portion remote from the axis, and adapted to retain material wedged therein.

2. A lining for a tube-mill comprising a series of ribs formed upon the interior surface of said mill, said ribs being narrower at the portion adjacent to the axis of said mill than at the portion remote from said axis, and grind-

ing bodies held frictionally in the recesses between said ribs.

3. A mill of the character described comprising a drum adapted to contain material to be pulverized and a grinding or abrading material, said drum being provided with a lining having recesses adapted to retain the grinding material wedged therein.

As Mr. Brown's U. S. application was dated June 13, 1906, and Mr. Hardinge's Mexican patent was issued January 22, 1907, and further, as it requires two to three months time in which to secure a Mexican patent, it would seem that Mr. Brown was the prior inventor of the El Oro tube-mill lining.

BLAISDELL COMPANY.

Los Angeles, December 6.

Cyanidation of Ore Containing Both Coarse and Fine Gold.

The Editor:

Sir—Yours of October 2 is to hand. The question you put is difficult to reply to. To begin with, the form of the question is indefinite; the expression "coarse gold" is a relative one, and gold that would be coarse from a cyanide man's point of view might be classed as fine gold by the alluvial miner. Of course your inquiry refers to ore and not alluvion, but it is quite conceivable that there may be ore carrying gold which even the alluvial miner would call coarse. The real point, however, would seem to be, not the condition of the gold as it is in the ore, but as it is in the pulp after having been comminuted for purposes of extraction; this again would necessitate the assumption of some stated degree of comminution. Before trying to reply to your question I should prefer, with your permission, to re-state it more definitely, if I can, while still preserving what I take to be the fundamental point at issue. If in so doing I have failed to grasp the exact point at which you were aiming I hope you will put me straight.

"Given an ore which, after having been ground or crushed or otherwise reduced to a pulp sufficiently fine to pass a 26-mesh screen, still contains, as well as gold finely divided, particles of gold that are too coarse to be dissolved by cyanide solution within a reasonable time and by the methods in commercial use at the present day, what steps would you take to save the coarse gold, which otherwise will escape solution in cyanide?"

The principal difficulty I find in replying to this question lies in the danger, which I have often had occasion to note, of trying to generalize in regard to the metallurgical treatment of gold and silver ores. It seems to me that before one could make a pronouncement as to how best to deal with "coarse gold" it would be necessary to study the particular conditions of an individual case, and even then the conclusions arrived at would not necessarily be applicable to any other mine or ore whatever.

I suppose that the competing methods in such a case would be, on the one hand, plate amalgamation, with or without subsequent cyanidation of the tailing, and on the other, re-grinding or otherwise finely subdividing the whole of the ore, or that part of it that accompanies the coarse gold, and cyaniding the whole without previous amalgamation. If you are disposed to doubt whether the latter is a legitimate and effective alternative to the former, I may state that I have personally had experience of instances where it has shown itself so to be. It is possible that there may be cases where the gold is too soft and pure to be readily disintegrated, but, if so, it would no doubt become flattened out into thin plates, which would be acted on by cyanide as rapidly as if it were mechanically subdivided.

To return to the first of my alternatives; I think that its adoption would rather depend on whether the gold, both coarse and fine, is easily detachable from the quartz, or in other words, it would depend on whether any considerable quantity of the gold was mechanically locked up in the quartz grains and therefore needed especially fine grinding to render it accessible. If, after plate-amalgamation and cyanidation of the tailing, the coarse sand did not contain sufficient insoluble gold to pay for fine grinding, then I should be inclined to declare in favor of my first alternative. If, on the other hand, the coarse sand showed sufficient residual inaccessible gold to indicate a profit on fine grinding, I should be content to recover all my gold by cyanidation alone.

It may be asked, why should these alternatives be considered mutually exclusive? Why should one not get all the gold possible by preliminary amalgamation, whether it be fine or coarse gold, and then re-grind, if necessary, prior to cyanidation of the tailing? The principal reason seems to me to lie in the difficulty of plate-amalgamation when crushing in cyanide solution. I am aware that some metallurgists have combined these two principles, but I think that the practice has not been widely adopted, and my own experience of it has not been encouraging. Moreover, if fine grinding be indicated at all, it is as easy to re-grind at one stage of the proceedings as at another, and if such re-grinding permits the cyanidation of all the gold that could otherwise be caught on the plates, why go to the extra trouble and expense of using plates?

Again, it may be asked, why crush in cyanide solution? Well, that is rather a vexed question, but I may state the fact, for whatever it is worth, that Mr. Charles Butters, after a plentiful experience of water-crushing, has deliberately adopted the practice of milling in cyanide solution in all the plants controlled by him, whether crushing ore from a mine or treating old tailing, and that this has been his invariable custom for at least seven years past. If I were asked what I considered to be the special advantages of this method I should say: First, the increased rapidity in the solution of the precious metals, which materially shortens the subsequent treatment and therefore reduces the size of the cyanide plant necessary for a given tonnage. This is especially marked in the slime portion of the pulp, where it is no uncommon thing to see from 70 to 80% of the gold contents passing into solution before treatment in the slime-vats begins.

The second great advantage I should ascribe to the method would be the fact that the introduction of large quantities of water into the solution stock is thus avoided. It is obvious that, considering any cyanide plant as a whole, no more water can be taken into the system daily than is withdrawn from that system in the same period; consequently, if, with every ton of slime, we take into our plant a ton of water, then for every ton of slime residue discharged we must get rid of a ton of solution in some way or other. Some do this in the form of moisture in the slime residue; and others, who prefer to displace part of this moisture (which, be it remembered, is solution) by water, run to waste an equivalent quantity of solution from the tail of their precipitation-boxes, so as to preserve the balance in the system. This difficulty is much accentuated where the slime residue is treated in filter-presses or vacuum-filters; it is to some extent mitigated where double filtering is practised, that is, where the excess water is extracted from the slime before cyanide solution is added, though even here, when the cake contains 25% of moisture, for every three tons of slime a ton of water is introduced into the system and a corresponding ton of solution has to be eliminated at some point,

rendering it difficult or impossible to give a displacing water-wash to the residue cake without running to waste weak solution. It is bad enough to have to throw away solution carrying cyanide even when its gold contents are nil or 'traces,' but I fear that in too many instances that so-called 'waste' solution is the vehicle of serious gold-losses in addition to the loss of the contained cyanide.

In the foregoing remarks ament the use of cyanide solution in the mill I have allowed myself to wander rather outside the limits of the matter under discussion, but I must ask you to excuse this on the ground that it seemed necessary to explain the position I took up in regard to the point at issue. To return to the subject of your question, I am inclined to think that there is a tendency to exaggerate the difficulties in cyaniding caused by coarse gold. At the mine where I am at present engaged the ore contains a considerable quantity of visible nuggetty gold, but we do not seem to have any trouble on that account. We clean-up some coarse gold periodically from our Huntington mills that has failed to pass an average mesh of about 25 holes per linear inch (several different sized screens are in use on different mills, and the coarsest of the sand issuing therefrom is re-ground in pans), but that is the only place where coarse gold makes its presence evident. The following is a representative screen-analysis of the sand portion of the pulp going to the cyanide plant:

Mesh.	%
+ 40.....	1.0
- 40 + 60.....	32.1
- 60 + 80.....	16.3
- 80 + 100.....	11.3
- 100 + 150.....	21.7
- 150 + 200.....	8.9
- 200.....	5.7
Slime.....	2.9

Concentration of this pulp has now been discontinued, but formerly it used to be passed over Frue vanners before going to the sand-plant. In the course of one of my experiments I took a sample of the resulting concentrate, which assayed \$348 per ton in gold (besides the silver, which we are not now concerned with). If there were any coarse gold liable to give trouble in the sand-vats it would surely be well represented in this concentrate, and yet three days' agitation in a bottle with cyanide solution sufficed to dissolve 95% of it without further grinding or sub-division of any kind. (The same concentrate when treated with the sand in the ordinary course without separation, yields about 97.5% of its gold contents.) Now, even if the remaining 5% in the above experiment be considered to be all "coarse gold" in the sense of our definition, and if in our actual treatment we did not succeed in dissolving more than was shown in this three-day bottle test, it would still only disturb the total extraction on our ore to the extent of 26c. per ton. It is more than probable, however, that this residual 5% of the gold in the concentrate was not all "coarse gold," but largely gold intimately associated with the sulphides.

With a battery head of \$8 or \$10 gold per ton the residue from the sand-vats will assay in gold as follows:

Mesh.	Cents.
+ 60.....	80
- 60 + 80.....	70
- 80 + 100.....	50
- 100 + 150.....	40
- 150 + 200.....	40
- 200.....	60
Slime.....	40

These assays would tend to show that "coarse gold" is not the most serious of the problems we have to solve at this mine.

E. M. HAMILTON.

Torres, Sonora, October 8.

The Roasting of Telluride Ores.—II.

Contributed to the MINING AND SCIENTIFIC PRESS
By R. L. MACK and G. H. SCIBIDD.*

The average cost of roasting average telluride ores is 89 cents per ton. Of this cost 40c. is fuel expense. At this time no practicable method has been discovered for the treatment of telluride ores without a preliminary roasting.

EXPERIMENTAL ROASTING.

The method used was as follows: In order to ascertain, if possible, the amount of gold lost by dusting and volatilization of the tellurium it was necessary to weigh out $\frac{1}{2}$ A. T. of each of the various sizes. Fine samples of each size were weighed, placed in $3\frac{1}{2}$ -in. scorifiers, and arranged in the reverberatory furnace. Four of them

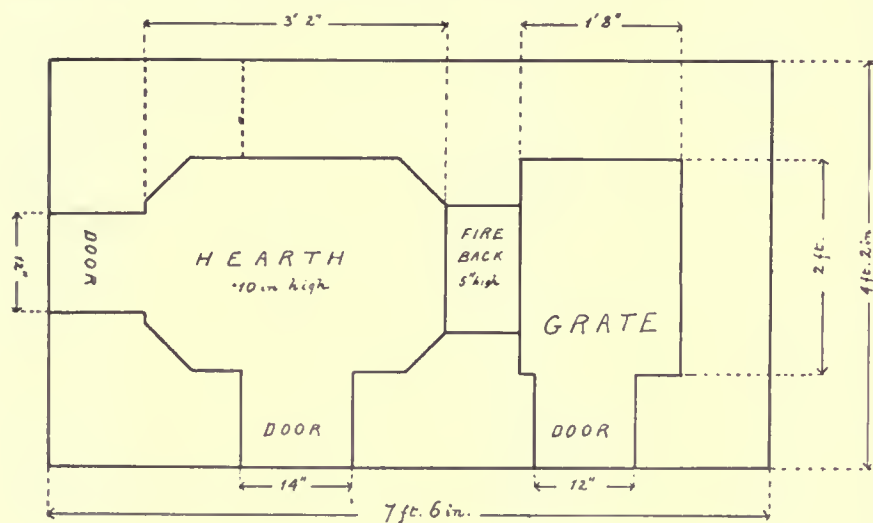


Fig. 1.

were to be used for assays of gold and silver, the fifth for a sulphur determination. By first assaying the raw ore and then assaying the roasted samples, the difference in the results would give the loss by dusting and volatilization. The process worked very well on the fine sizes, but not at all on the sizes coarser than 60 mesh, due primarily to the impossibility of obtaining an accurate sample, and secondarily to the difficulty of fusing the coarse ore. The necessity for weighing our samples before roasting them was due to the concentration resulting from driving off 3 to 4% of volatile substances. Several methods were tried to assay the coarse samples, but were not satisfactory. The best method is to grind them, after roasting, on a clean bucking-board, using the fluxes to clean the board after each grinding; however, even with the greatest care the results are not very satisfactory.

The concentration due to the driving off of sulphur and tellurium is nearly counterbalanced by the oxidation of Fe to Fe_2O_3 , but there is an unknown amount of concentration, which must be taken into account. Three separate roasts were made in the manner previously described; assays were run for gold, silver, and sulphur, before and after roasting.

TEMPERATURE DETERMINATIONS.

In our first tests we used a Chatelier pyrometer with a thermo-couple of one platinum wire and one wire composed of an alloy of platinum and 10% of rhodium. This couple was introduced into the reverberatory furnace at the flue end, as shown in the sketch. It was encased in $\frac{3}{4}$ -in. gas-pipe, plugged and capped on the inner end,

which enclosed a fused silica tube. The silica tube, sealed at the inner end, contained in turn, a double-bored fire-clay tube, through which the wires of the couple were drawn. These precautions were necessary in order to prevent any possibility of the furnace gases coming in contact with the couple, as platinum has the property of absorbing reducing gases, which reduce the slight amounts of impurities present in the platinum and cause a change in the electro-motive force of the couple.

By the use of such a couple only average temperatures in the furnace could be obtained, as the couple did not readily enough respond to changes in temperature, and also, due to its position, temperatures in other parts of the furnace could not be read. As it was desirable to read the temperature of each scorifier in the furnace a Fery radiation pyrometer was secured, which made possible the reading of the temperature

of each scorifier in the furnace at frequent intervals. Thus the best conditions for elimination of the sulphur, and consequently of the iron also, could be determined. The Fery pyrometer depends in its action upon the law of Stefan and Boltzmann, which is that the heat radiated by any heated body is proportional to the fourth power of its absolute temperature. In order to make use of the facts underlying this law, a concave metallic mirror is used to focus the heat waves radiating from the heated body upon the junction of a copper constantan couple. The electro-motive force generated by the action of the heat on the dissimilar wires is recorded on a galvanometer, so calibrated as to read degrees as

well as millivolts. The mirror and junction are housed in a metallic cylinder, so supported on a telescopic adjustable tripod as to have freedom of motion about a vertical axis. Focusing of the pyrometer is done by means of a thumb-screw, which causes the two halves of the inserted image to come into coincidence on either

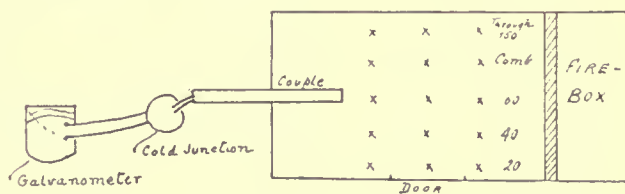


Fig. 2.

side of a horizontal cross-wire. The furnace used was of the reverberatory type, as shown in the accompanying sketch. (Fig. 1.) Sketches are also appended to show the arrangement of the samples on the hearth during the roasts. (Fig. 2.) Also tables of temperature and curves to illustrate the variation of the temperatures.

PRELIMINARY ROAST.—A preliminary roast was first conducted as follows: A bed of ore about three inches deep was placed on the hearth, the furnace having been previously heated. As the temperature was raised, samples were taken at intervals of 20 minutes. The ore was well rabbled as the roast proceeded. The temperature was not sufficient to drive off all the sulphur, but the results obtained serve to show the rate of sulphur elimination. The original sulphur content was 3.08% and the final content was 1.02%. This shows that probably the temperature was only sufficient to drive off the first atom

*Submitted in partial fulfillment of the requirements for the degree of Bachelor of Science in Mining Engineering, under the Faculty of Engineering of Colorado College.

of sulphur, and the FeSO_4 formed was not disassociated:

Sample	Sulphur.		Minutes.
	Original	3.08%	
1	1.28	.....	20
2	1.03	.....	40
3	1.02	.....	60
4	1.02	.....	80
5	1.02	.....	100
6	1.02	.....	120

The above table shows the sulphur content and the rate of elimination. It shows that the greater part of the sul-

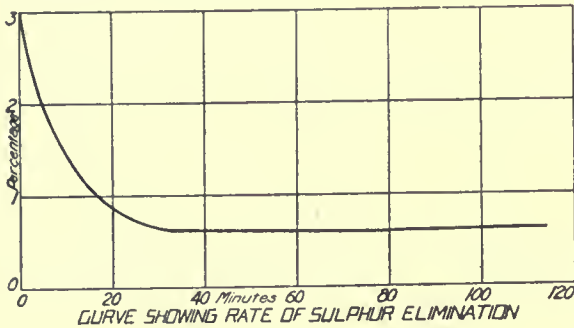


Fig. 3.

phur is driven off in the first part of the roast, and that to complete the sulphur elimination a much higher temperature is required. The curve appended shows this more readily.

Roast No. 1.—Three samples of each size were weighed and placed in 3½-in. scorifiers. The furnace was heated and the samples arranged on the hearth as shown in the following diagram: (Fig. 4.)

There was such a small percentage of sizes 80, 100, 120, and 150 mesh that they were combined. The heat was steadily increased over a period of 2½ hours, the temperature as indicated by the couple was read at intervals

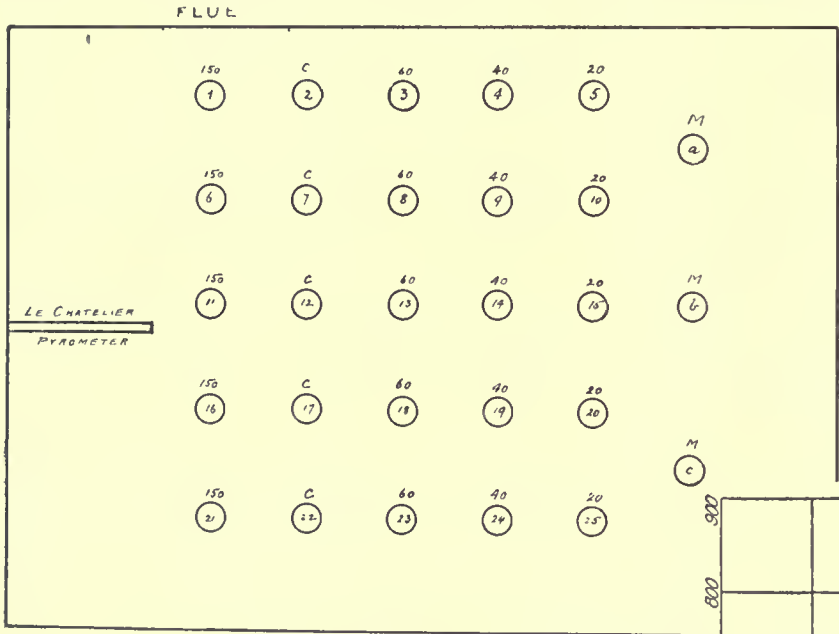


Fig. 4.

of 15 min. during the roast. The following table and curve show the results of this roast. The temperatures are given in both Centigrade and Fahrenheit degrees:

ROAST NO. 1.			
MESH.	Sulphur percentage.		Eliminated, %.
	Original.	Roasted.	
20	2.61	0.336	86.9
40	2.47	0.281	88.7
60	2.62	0.212	91.9
80 to 150	3.04	0.201	93.4
Through 150	3.93	0.116	96.9

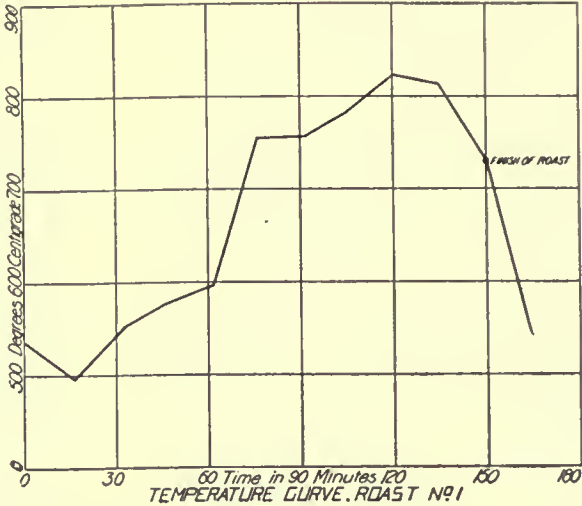


Fig. 5.

This table shows that the fine contains a higher percentage of sulphur than the coarse; also that the sulphur elimination is best in the fine. The temperatures employed to effect the best sulphur elimination were, starting at 496° C (925° F), to raise slowly to 837° C (1,539° F). Time required was 1 hr. 45 min. for a small sample.

Time.....	Interval, minutes.	Deflection.	Gold Junction.	Temperature.		Remarks.
				Degrees C.	Degrees F.	
3:00	40.0	19	536	997	Started roast at 3 hr. 19 min. 7 sec.
3:16	16	36.3	.....	496	925
3:32	16	42.8	.....	560	1,040
3:46	14	45.1	585	1,085	Reached 804°C during this interval.
4:02	16	47.1	21	607	1,125	
4:16	14	63.0	.....	766	1,411
4:32	16	63.2	.....	768	1,414
4:45	13	65.7	25	792	1,458	Allowed furnace to cool down.
5:00	15	63.9	.....	837	1,539
5:15	15	69.0	.....	826	1,519
5:30	15	60.5	26.5	714	1,317	
5:47	17	41.5	.....	550	1,022

Roast No. 2.—This roast was conducted just as in the previous experiment, except that the arrangement of the various sizes in the furnace was different. In the first case the fine was in the hottest part of the furnace, while in this roast the coarse occupied the hottest place. As shown by the table, the temperature at starting was higher and the maximum temperature obtained was not so great. The range of temperature was 546°C (1,015°F) to 799°C (1,470°F). The best sulphur elimination was obtained on 20-mesh size, due to the

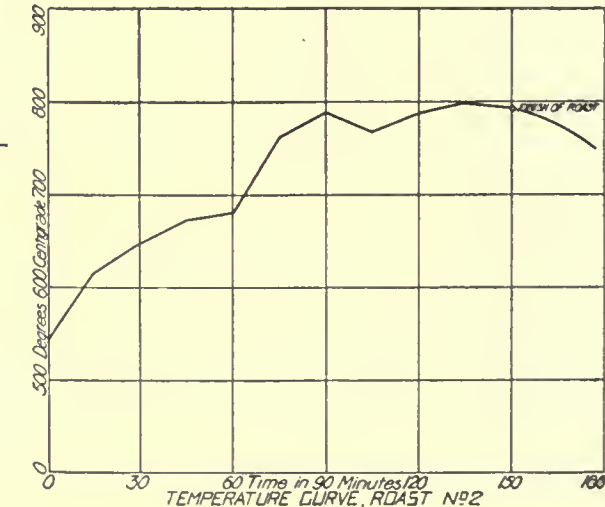


Fig. 6.

ROAST NO. 2

Mesh.	Percentage of sulphur.			
	Original.	Roast.	Soluble.	Eliminated.
20	2.61	0.12	0.08	95.4
40	2.47	0.16	0.12	93.5
60	2.62	0.13	0.08	95.0
Comb.	3.04	0.48	0.33	84.2
150	3.93	0.99	1.71	74.8

ROAST NO. 2.

Time	Interval Minutes	Deflection Millivolts	Cold Junction Degrees C	Temperature.		Remarks.
				Degrees C.	Degrees F.	
2:40			19.5	546	1,015	Started roast.
2:55	15	48.0		615	1,139	Reached 661° C during interval.
3:10	15	51.0	21.0	617	1,197	Fired up. Reached 726° C during interval.
3:25	15	53.4		671	1,240	
3:40	15	54.1	26.0	680	1,256	Reached 745° during interval.
3:55	15	62.2		760	1,400	
4:10	15	65.0	27.0	789	1,452	} Varied from 755° C to 794 during this interval.
4:25	15	62.8	29.5	768	1,414	
4:40	15	64.5	31.0	786	1,447	
4:55	15	65.8	33.5	799	1,470	
5:10	15	64.9	35.0	792	1,456	Allowed to cool.

fact that it was the hottest part of the furnace.

Roast No. 3.—In this experiment the temperature determinations were more complete than in either of the previous ones. Both the Fery and the thermo-couple were used to determine the temperature. The thermo-couple alone gives the temperature of only a part of the furnace, while by the use of the Fery, the temperature of the individual scorifier can be determined. Five samples of each size were placed in the furnace, in the positions shown in the accompanying sketch (Fig. 8); also three other scorifiers, in each of which was a quantity of the ore as it came from the rolls, being a fineness of about 14-mesh. These last three were to determine the point at which the ore frits. They were placed in the hottest part of the furnace near the fire-back.

The method of getting the temperature was as follows: The Fery was set up in front of the door, as shown in Fig. 4, and then the temperature as determined by the thermo-couple, which was inserted at the flue end of the furnace was recorded, after which the side door was opened and the temperature of the various scorifiers was read and recorded. At the end of the readings, the couple temperature was again recorded, thus showing the amount of cooling (due to the opening of the side door) during the reading. In this way the best temperature to give the best sulphur elimination could be ascertained; also the distribution of the heat over the furnace hearth could be noted.

The following tables and curve show the results of roast No. 3 :

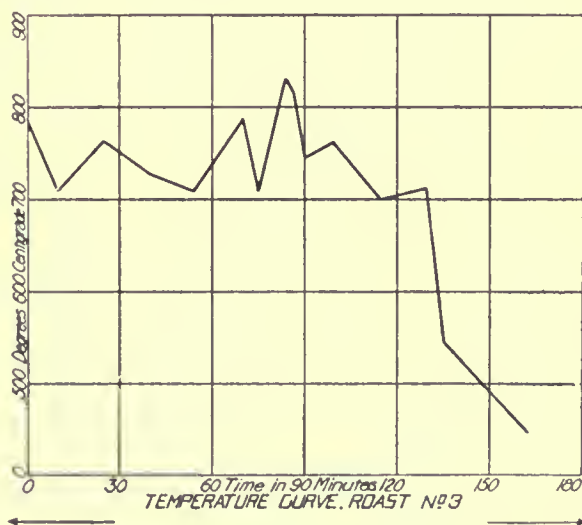


Fig. 7.

THE LOSS BY DUSTING AND VOLATILIZATION.

The assays of the various samples of roasted and unroasted ore were run under as nearly identical conditions as possible. Both scorification and crucible assays were used. The following table shows part of the results of these assays :

Sulphur percentage.

Gold assay.

Mesh.	Original	Recast	Soluble	Eliminated	Original	Recast	Loss in cold
20.....	2.61	0.18	0.11	93.1	1.40	.....	.....
40.....	2.47	0.10	0.08	95.9	0.98	.....	.....
60.....	2.62	0.12	0.095	95.4	1.37	1.34	0.03
Combined	3.04	0.12	0.095	92.9	1.49	1.46	0.03
Through 150.....	3.93	0.21	0.151	91.6	1.57	1.54	0.03

Mesh.	Original.	Roasted.	Loss.	%	Remarks.
Through 150.	Oz. 1.57	Oz. 1.51	Oz. 0.03	1.92	Mean of four.
Combined.....	1.49	1.46	0.03	2.01	" " "
60.....	1.37	1.34	0.03	2.19	" " "

This shows a mean loss of 2.04% of the original gold content. As the roasting was done in scorifiers and a very thin bed naturally resulted, no rabbling was necessary. Therefore, the loss due to dusting was only that caused by the escape of the volatile gases. The determination of the amount of loss due, respectively, to dusting and volatilization is a problem in itself. However, it seems likely, having regard to the temperatures at which these roasts were conducted, that most of the loss is due to dusting.*

The highest temperature used on these roasts was 1,065° C. The mixed sizes of ore in the three test scorifiers fritted at 1,095° C. It is claimed that there is no loss of gold due to volatilization below 1,100° C.† The distribution of temperatures in the furnace as given by the Fery pyrometer is shown below:

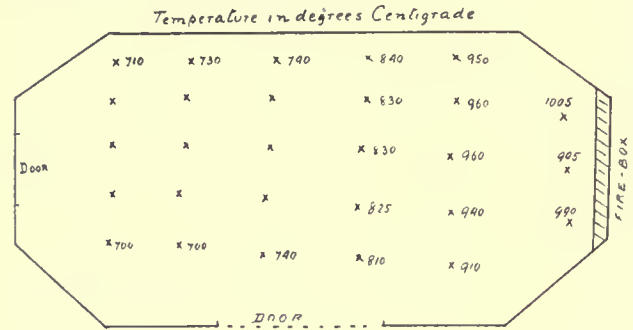


Fig. 8.

As would be expected, the highest temperature is near the fire-box, the coldest part near the flue.

MODERN PRACTICE IN THE ROASTING OF TELLURIDE ORES.

By means of the Fery pyrometer we are enabled to read the temperature employed in one of the more prominent mills for the roasting of telluride ores. The furnaces were of the Pearce and Holthoff types. The Pearce furnace is an annular stationary hearth, with moving water-cooled rabblies, having four fire-boxes distributed around the outer circumference. Bituminous coal is used as fuel, the draught being increased by a jet of steam blown through the grate. The fire-boxes are not placed at equal intervals around the furnace, but are arranged about as follows:

- From flue to first fire-box is about 65 ft.
- " box 1 to box 2 " " 40 "
- " " 2 " 3 " " 30 "
- " " 3 " 4 " " 20 "

The flame travels counter clockwise around the annular hearth, while the ore (which is fed in near the flue) travels clockwise, thus moving from the coolest to the hottest part of the furnace, the discharge being about 20 ft. beyond the last fire-box. A chart is appended to show the various positions taken during the reading of the temperatures and the table shows the result of the reading:

READINGS AT POSITION No. 1. 22 Ft. FROM FLUE TOWARD BOX 1.

	°C.	°F.	Remarks.
1.....	560	1,040	Rabbles before firing.
2.....	660	1,220	" " after "
3.....	540	1,004	Gases above ore.
4.....	540	1,004	" " "
5.....	530	986	" " "
6.....	540	1,004	" " "

*Several custom mills allow 3% for loss due to dusting and volatilization.
†British Association. Report, 1897, p. 623.

POSITION No. 2. 2 Ft. FROM BOX 1 TOWARD FLUE.			
	°C.	°F.	Remarks.
1.....	855	1,571	Reading on ore 2 ft. from aperture.
2.....	925	1,697	Inner wall—across hearth.
3.....	925	1,697	Half-way across hearth.
4.....	835	1,535	1½ ft. from aperture—on ore.
5.....	855	1,571	2½ " " "

POSITION No. 3. 2 Ft. FROM BOX 1 TOWARD BOX 2.			
	°C.	°F.	Remarks.
1.....	780	1,436	On brick-work—across hearth.
2.....	822	1,512	Ore against back side of hearth.
3.....	812	1,494	" " on middle of hearth.

POSITION No. 4. HALF-WAY BETWEEN BOX 1 AND BOX 2.			
	°C.	°F.	Remarks.
1.....	850	1,559	On ore one-third across hearth from opening.

POSITION No. 5. BETWEEN BOX 3 AND BOX 4.			
	°C.	°F.	Remarks.
1.....	895	1,643	Across hearth on roof.
2.....	870	1,598	" " " wall.
3.....	825	1,517	On ore 3 ft. from opening.
4.....	800	1,472	Rabble shoe.

POSITION NO. 6. AT DISCHARGE.			
	°C.	°F.	Remarks.
1.....	860	1,580	Across hearth on wall-top.
2.....	855	1,571	“ “ “ “ bottom.
3.....	750	1,382	Ore at discharge.
4.....	990	1,814	Gas from box 4.

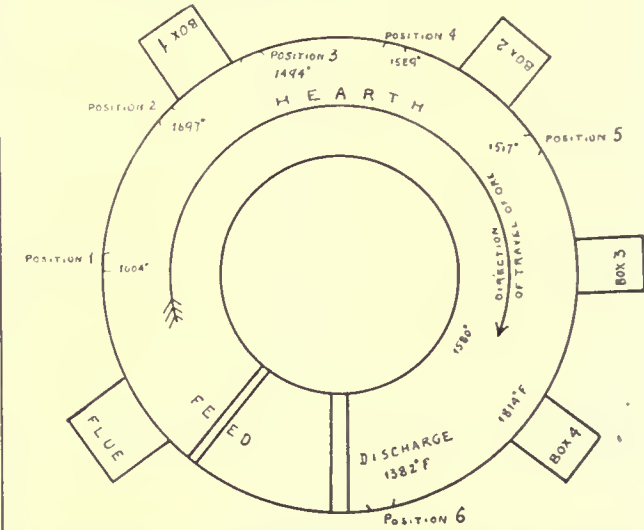


Fig. 9. Chart Showing Positions of Readings on Pearce Furnace.

POSITION No. 1.			
	°C.	°F.	Remarks.
1.....	720	1,328	Ore on far side of hearth.
2.....	970	1,778	Gases from producer.
3.....	970	1,778	Ore below flame.
4.....	865	1,589	" 2 ft. from opening.

POSITION No. 2. 30 Ft. FROM POSITION No. 1 TO RIGHT.			
	°C.	°F.	Remarks.
1.....	800	1,472	Brick across hearth.
2.....	990	1,814	Gases from port.
3.....	1,025	1,877	" " "
4.....	810	1,490	Ore across hearth.
5.....	890	1,274	" 3 ft. from opening.
6.....	720	1,328	" about middle.
7.....	745	1,373	Rabble far side of hearth.

POSITION No. 3. 18 Ft. FROM POSITION No. 1 TO LEFT.			
	°C.	°F.	Remarks.
1.....	780	1,436	Rabbles inside of hearth near wall.
2.....	900	1,652	Gas from producer.
3.....	1,010	1,850	" " "
4.....	830	1,526	Ore under port.
5.....	765	1,409	" in middle of hearth.
6.....	715	1,319	" 2½ ft. from opening.
7.....	500	932	" from discharge pipe.

The second furnace from which temperatures were taken was a Holthoff. This differs from the Pearce in having a movable hearth with stationary rabblies, the

gases being supplied from a producer in the centre of the furnace. The flame travels directly across the hearth in a radial direction to a series of small flues, which lead to the main flue. The ore, fed at the circumference, travels toward the inside of the hearth, where it is finally discharged to the cooling-hearth below. The following chart shows the positions from which the readings were taken and the table shows the results of the readings:

CONCLUSIONS.

From the results of our tests on small samples of ore of various degrees of fineness, we are led to conclude that:

1. The degree of fineness, if it is under 14-mesh, does not appreciably affect the amount of desulphurization, the important factor being high temperature with a sufficient amount of air.

2. The actual loss of gold by dusting and (possibly) volatilization was the same for sizes through 150-mesh to 60-mesh inclusive, but the percentage loss was slightly greater for the coarse sizes.

3. The average percentage loss was 2.04%. This

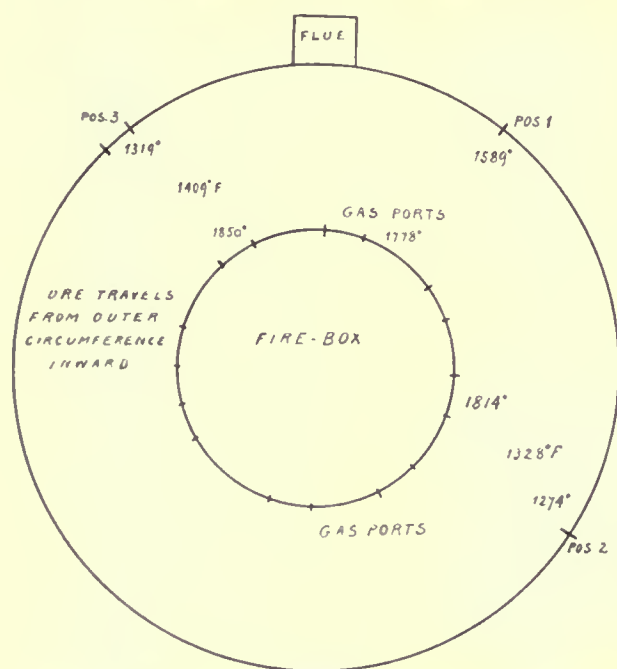


Fig. 10. Chart Showing Positions of Readings on the Holthoff Furnace.

would probably not hold exactly in practice, because in the mills the flue-dust is recovered and re-treated.

4. Sulphur is eliminated equally as well by using a high first temperature as by using a low first temperature, but loss by dusting is increased.

5. The object in roasting is not the elimination of sulphur, but of tellurium, the elimination of sulphur being an indication that tellurium is also eliminated. There is no practicable method for the determination of tellurium in works practice.

6. Calaverite melts at 365° C (689° F). If the telluride is present in large pieces due to coarse crushing of the ore, shattering of the gold results at temperatures from 550° C (1,031° F) to 1,064° C (1,947° F), the latter being the melting point of gold. Advantage is taken of this fact in the process worked out by Sutherland and Marriner, in which the shot gold is caught on amalgamated plates.

7. That this telluride ore, which is representative of the Cripple Creek district, crushed to go through a 14-mesh screen will be fritted at a temperature of 1,095° C (2,000 F).

Finally, we wish to express our obligation to Thomas T. Read, professor of mining and metallurgy, who directed the work of the investigation, to the Portland

Gold Mining Co., for the gift of the ore for the experimental work, and to G. M. Taylor, superintendent, and J. M. Tippet, metallurgist, of the company for valuable suggestions and assistance during the progress of the work.

BRITISH MINING.—The total number of persons employed in and about all the mines of the United Kingdom in 1906 was 912,576, of whom 882,345 worked at the 3,278 mines under the Coal Mines Act and 30,231 at the 715 mines under the Metalliferous Mines Act. Compared with 1905, there was an increase of 23,972 persons at the former and of 1,080 persons at the latter. At the coal mines 80% worked below ground, while of the surface workers 3.16% were females. The total output of minerals under the Coal Mines Act was 265,204,716 tons, an average per underground employee of 374 tons, an increase of 13 tons on the preceding year. Of the production, 251,050,809 tons were coal, 2,971,173 fire clay, 8,209,880 tons ironstone, 2,546,113 tons oil shale, and 426,741 tons sundry minerals. Adding 16,819 tons from open quarries, the total output of coal was 251,068,628 tons, which is an increase of 14,938,692 tons on that of the previous year. The total output under the Metalliferous Mines Act was 3,712,436 tons, of which 1,824,415 tons were iron ore. The total quantity of stone and other minerals obtained from the quarries under the Quarries Act was 46,985,443 tons, of which 4,410,291 tons were iron ore. Adding to the produce of mines and of quarries over 20 ft. deep 1,055,820 tons obtained from shallow open workings, there was a total output of iron ore of 15,500,406 tons. The death rate of the underground workers under the Coal Mines Act was 1.42 per thousand persons employed, against 1.49 in 1905. The death rate in the metalliferous mines of the underground workers was 1.63 per thousand persons.

AN UNDERGROUND ELECTRIC FORGE.—The Village Deep Mine, in the Transvaal, is installing a newly invented electric furnace for underground use in drill sharpening. Should it prove successful the direct economies resulting from its general use will be considerable, as it will overcome the difficulties of overheating and burning the steel and obviate the expense, labor, and delay of carrying the drills to the surface every time they require sharpening. The initial tests are being carried out at the surface, and subsequently lengthy and rigid tests will be made underground, and if the results come up to expectations, then one furnace will be supplied to every three levels. This furnace, if the success expected is realized, will have a far-reaching effect upon working costs at the Rand mines. Several managers have already stated that they now use steel of a medium quality in preference to the best steel, for the reason that under the present system of heating the best steel is often burnt, and is invariably reduced to the quality of poorer steels. The latter, on the other hand, are found to suffer no corresponding falling off in quality. This practice, which is by no means general, may largely account for the complaints made regarding faulty steels. Should this furnace prove the success indicated, then the best steel only should be used, with the results that fewer complaints will be made about the blunting of the drills. Certainly much more attention ought to be given to the important questions of tempering and sharpening drills, not merely in the Rand mines but also in other mining fields.

THE COPPER ORES of the Copper River district of Alaska occur along the contact between a semi-crystalline limestone and a greenstone; the greenstone is probably an ancient lava-flow.

The Tyee Smelter.

Written for the MINING AND SCIENTIFIC PRESS
By RALPH L. PHELPS.

To reach the reduction works of the Tyee Copper Co., Ltd., at Ladysmith, on Vancouver Island, the traveler leaves Victoria at 9 o'clock in the morning on the daily passenger train of the Esquimalt & Nanaimo Railway, which connects Victoria with Ladysmith and Wellington, the last being the terminus in the coal mining districts. This local line is owned by the Canadian Pacific Railway, and though running through productive agricultural valleys and important mining districts, despatches but one train each day simultaneously from each end of the line. With good luck and perseverance on the part of the engineers, the toy Baldwin engines manage to pull these trains the 77 miles in about 4 hours, when on time. But the delightful country and scenic beauty of the interior of Vancouver Island reward the traveler amply for the tediousness of the journey. The general

which will run out for about 400 ft. into deep water. On this wharf there will be erected one 300-ton stationary bunker and one 60-ton movable bunker. The reason for having a movable bunker is to allow the unloading of any two hatches in a ship at one time. On the top of these bunkers there will be an electrical hoist, capable of handling 30 tons per hour. The ore from these bunkers will be run into 2-ton side-discharging cars. The intention is to work three sets of cars, each set containing five cars. While one set is being loaded one set is being dumped, and the third set is on the way between the wharf and the storage bunkers, which are connected by an incline 1,200 ft. long. The train of cars is hauled up this incline by means of a large hoisting engine. As soon as a train of cars reaches the top of the incline an electric locomotive hooks on and they are run over a 40-ft. platform-scale with self-registering beam. After being weighed, part of each train is switched to the sample-bin and the remainder run to the storage-bunkers. These bunkers will have a capacity of 5,000 tons. The new

equipment will be electrically operated and power for this work will be supplied by a new steam-driven generator, recently ordered from the Allis-Chalmers-Bullock Co. This will effectually reduce the present cost of handling and also save considerable time. Coke is delivered at the smelter in 20-ton rack cars by the Wellington Colliery Company.

Formerly all the ore treated at this smelter was roasted in piles on a specially prepared yard, a description of which appeared in this paper, but at the present time no roasting is done and the old roast-yard is used for the storage of ore. The sampling mill is of the latest design and has a capacity of from 30 to 40 tons per hour. The building is shown on the extreme left in the photograph.

The present furnace equipment consists of one 200-ton Allis-

Chalmers water-jacketed furnace, 42 by 120 in. with a 10-ft. ore column. The ordinary capacity of this furnace is about 200 tons per day, but at the Tyee plant they are successfully smelting from 250 to 300 tons per 24 hours with a blast-pressure of between $1\frac{1}{2}$ and 2 pounds. The furnace is fed by hand from both sides simultaneously. The blower-equipment consists of an Allis-Chalmers Corliss engine, belt-connected to a No. 7 Connersville blower.

The slag and matte from the furnace flow over a water-jacketed bronze spout and drop into a settler, which has been designed and perfected by Mr. Watson. This settler has proved highly efficient. Designed on lines similar to the commonly, though erroneously called, 'syphon' settler, Mr. Watson describes it as a matte separating fore-hearth. A photograph is shown herewith. This water-jacketed fore-hearth is 10 ft. long, 4 ft. deep, and lined with $4\frac{1}{2}$ in. fire-brick. If, by any chance, the pocket should 'freeze', it can be taken off, the brick and chilled matte barred, and a new lining built in. By carefully drilling a hole through the frozen connection, so as not to disturb the settler lining, it can be started again without interfering with the running of the furnace. While this is taking place the settler is tapped in the usual way through a bronze tapping-jacket, which is used for emptying the settler when blow-



The Tyee Smelter.

offices of the Tyee Copper Co., and the residence of the general manager are at Duncans station, 40 miles from Victoria, and the mine itself being situated in the mountains 5 miles from Duncans. The reduction works are situated at Ladysmith, on Oyster bay, an inlet of the Gulf of Georgia, on the east side of the Island. W. J. Watson is the manager of the smelter.

The ore from the Tyee mine is brought down to the railroad by a Riblet aerial tramway, $3\frac{1}{2}$ miles long, having a drop from the mine of 1,700 ft. The ore is here automatically dumped into storage bins on spur tracks and hauled by train to the bins at the smelter. As the tonnage capacity of the smelter is greater than the present daily output of the mine, Mr. Watson is handling a large proportion of custom ore as well. Owing to the advantage of being situated on deep water, the works receive copper ore from the Snowstorm mine in Idaho, from Prince of Wales island, and the British Columbia coast; gold ore from White Horse in the Yukon; and silver ores from Mexico.

At the present time all ore coming by the sea is unloaded at the Dunsuir wharf at Ladysmith into hopper-bottom cars and thence switched to the smelter bins, distant one mile. This method of handling the ore will be greatly improved upon, as the company is at present pushing work on the construction of their own wharf,

ing out the furnace. The hole connecting the pocket with the settler is 4 by 6 in. and is lined with chrome brick. The matte spout on the pocket is about three inches lower than the slag spout on the settler. The flow of matte is regulated by manipulating the slag outlet. If not sufficient matte is running, the slag outlet is raised slightly by pressing in a small ball of clay on the point of a rod; if too much matte is running, the slag outlet is opened a little. The depth of matte in the settler is ascertained every hour, and as near as possible 8 or 10 in. of matte is kept in the bottom. This settler has been used successfully for over two years and the difference in the slag contents more than paid for it in one month, besides doing away in a great measure with the possibility of men being burned. There is also a considerable saving in pots and clay. At works where the matte is not tapped for immediate converting, the settler would be invaluable, and doubly so where a large quantity of low-grade matte is made. The Tyee ore runs about 4% copper and a 40% matte is produced. The

and settler-attendants are either Americans or Englishmen, as the work requires more skill. Three 8-hour shifts operate the furnace and the wage paid for this work ranges from \$3 to \$4.25 per day. It is interesting to note that English and American carpenters receive \$4.25 for 8 hours work and their helpers receive \$3. They begin work in the morning at 7 o'clock and stop at 4 in the afternoon. This seems a high wage for such skilled labor and it appears odd to an American to see men stop work so early in the afternoon.

The town of Ladysmith is the home of hundreds of miners employed in the near-by coal mines. Presenting an almost deserted appearance during the day, it becomes animated with the arrival and departure of the coal miners trains, which makes the run between Ladysmith and the adjacent mines at the end of each shift. With one main business street of several blocks, Ladysmith boasts a good commercial hotel and the inevitable branch of the Canadian Bank of Commerce. The writer is under obligations to the late Clermont Livingston, to W. J.



The Watson Fore-Hearth.

matte is run into conical pots, which are of standard wheel-body construction. When filled, they are wheeled to the cooling-floor; later, the matte is broken up for shipment to the Tacoma refinery.

The disposal of the slag at Ladysmith is effected in an economical manner. The molten slag from the settler is led directly into water-flushed launders, where it is granulated and carried 400 yards into the bay. Use of the slag is made in filling in a shallow arm of the bay near the smelter, for future yard-room. As the slag enters the launder and comes in contact with the water, fumes of sulphuretted hydrogen are given off, due to the decomposition of a small percentage of barium sulphide in the slag.

In the disposal of the flue-dust, the practice is to wet it down thoroughly and feed directly into the furnace.

The cost of coke delivered at the different smelters on Vancouver Island is about \$7.50 per ton. The labor employed in handling the ore and coke in the yards is principally Chinese and Japanese. These laborers receive from \$1.75 to \$2 per day for 10 hours. The furnace-men

Watson, G. B. Kitto (Mr. Watson's assistant), and George Williams (who is superintending the construction work) for many courtesies and for valuable information.

MEASURING MASONRY.—It is customary to measure all foundation and dimension stone by the cubic foot. In stone work corners of buildings are measured twice, and arches are counted solid from their spring. One cord of rough stone, three bushels of lime, and one cubic yard of sand will lay 100 cu. ft. of wall. When suitable stone cannot be found for engine foundations, concrete composed of one part of No. 1 portland cement, two parts coarse sand, and five parts of stone, broken to the size of egg coal; coarse gravel may be substituted for stone. Turn and mix while dry, twice. Turn and mix with water twice, and place. If the concrete is to be richer, use more cement. Brickwork is usually measured by the 1,000 brick laid in the wall. In consequence of the variations in the size of common brick, no rule for volume of laid brick can be exact.

The History of Gold and Silver.

By JAMES W. MALCOLMSON.

*The history of gold and silver to a large degree is the history of civilization. These metals have been found in all countries of the world and are widely diffused throughout the crust of the earth. In the earlier ages of the world, gold was obtained more readily than silver, as it is not affected by oxidation or decay. On account of its weight, it settles in the metallic state in streams to the bedrock, and on account of its resistance to natural leaching processes, it is often found at the outcrops of mineral deposits where all other minerals have disappeared entirely.

Silver, on the other hand, is but seldom found in the metallic state, but is more often mixed with gold, lead, copper, or zinc. Pure silver minerals, such as the chloride or sulphide, are almost as rare as native silver, and silver ores are usually complex mixtures in which other metals predominate. The processes of treatment of silver ores are therefore more complex than those of gold, and the metal is only obtained by regular underground mining operations, as it is but rarely carried far away from the zone of its original deposition.

It is probable that gold was employed long before silver was known, and the value of silver in some ancient states appears to have been superior to that of gold. Even in Japan, up to the seventeenth century, the value of gold and silver were almost equal. Soon after the first opening of that country to commerce, the Dutch secured nearly all the gold of Japan in exchange for silver, before the Japanese learned the difference in values in Europe.

In ancient Greece in the days of Herodotus, gold was thirteen times more valuable than silver and this ratio appears to have been fairly constant for many centuries. For nearly 1,000 years, to the fall of Constantinople, the ratio of value of gold to silver in the Roman Empire was approximately 12 to 1. In Arabia, in the sixth century, the ratio was 6½ to 1, while at the same time it was 10 to 1 in France.

In Spain in 1493 it was 10½ to 1.

In 1500 the ratio of value of gold to silver was 10½ to 1.

In 1600 it was 12 to 1.

In 1700 it was 15 to 1.

In 1800 it was 15½ to 1.

In 1900 it was 33½ to 1, probably on account of its demonetization throughout nearly the whole of Europe and America.

It was a remarkable fact that from 1660 to 1860, a period of 200 years, the ratio of the value of gold and silver remained almost stationary at 15½ to 1.

The search for gold has been the first cause of the settlement of much of the earth's surface by civilized races. Del Mar believes that the Argonauts, who sailed from Thessaly with Jason to obtain the golden fleece in Colchis, were probably leaders in a rush to new goldfields or placer deposits along one of the rivers flowing into the Black Sea. The allusion to the golden fleece perhaps indicates the use of sheep-skins in sluice-boxes in the way that we still use woolen blankets for the same purpose.

The settlement of Egypt by the Semitic races of Asia has been thought to have been contemporaneous with the first discovery of the gold mines of the peninsula of Sinai more than 2,500 years before Christ and the Phœnicians and Jews, the kinsmen of these hardy pioneers, went out and searched the whole world for minerals. In the Book of Job, supposed to have been written 1,500 years before

Christ, a notable reference to gold and silver occurs, as follows: "Surely there is a vein for the silver and a place for gold where they find it, as for the earth, the stones of it are the place of sapphires and it bath dust of gold." Of Solomon, who lived 1000 B. C., it was said that "All his drinking vessels and all the vessels of his house were of gold, none were of silver, it was nothing accounted of in the days of Solomon." It is a curious fact in the history of mining, that no matter how intelligent or economical a man may be, if he be unsuccessful in finding ore, his industry and talent count for nothing; and no matter how imprudent or unintelligent he may really be, if he finds rich ore and makes a high profit, he is hailed everywhere as wisdom personified. It was probable that something of this sort happened to Solomon, and since then his mines have been the theme of the novelist and poet. He was closely allied with both the Egyptians and the Phœnicians; he married Pharaoh's daughter and was a close friend and ally of Hiram of Tyre, King of Phœnicia. On account of his success in gold mining in Africa, in Egypt, and elsewhere, it is probable that every wise saying for centuries was attributed to him. Even his matrimonial adventures are more or less characteristic of many successful mining operators of our own time. In southwestern Africa, over an area of 600 miles square, the ruins of fortified cities and great mining camps are found, about which almost nothing is known today, except that the occupation of the ancient inhabitants was gold mining. It is estimated that over \$400,000,000 of gold was extracted from these mines.

Andrew Lang says of them:

"Into the darkness whence they came, they passed,
Their country knoweth none;
They and their goods without a name
Partake the same oblivion
Their work they did, their work is done
Whose gold it may be shone like fire,
About the brows of Solomon
And in the House of God's desire.
We know but that men fought and fell
Like us, like us, for love of gold."

The silver mines of Laurium, 30 miles west of Athens, were worked for centuries by the Greeks and are referred to by Tacitus, Aristotle, and many other writers. They seem to have been worked originally by the Phœnicians in 1200 B. C. Demetrius, a Greek writer, who lived 300 B. C., boasted that the Greeks worked these properties with such energy that they threatened to dig up the devil himself. Shortly after this period, mining operations ceased. The mines of Laurium were reopened successfully by the French in 1860 and are paying dividends at the present time.

In the search for gold, the Phœnicians, and afterward the Romans, who were more skillful miners than the Greeks, were led to Spain, which was to the ancient world what Mexico is to us today, but, during the most critical period of the Punic wars, Rome debased its silver money and demonitized its copper coinage, because the silver and copper supplies of the world at that time came from Spain, then in possession of the Carthaginian army. Hannibal, however, had other resources, and this became, probably, the first great war in history where the troops of both armies were paid in gold coin.

In the fourth century the Romans worked gold mines in every province of Europe, and practically all the gold known at that time was in their possession. Humboldt is authority for the statement that America was discovered because Columbus sought a nearer way to the gold mines of Japan, while Cortez and Pizarro penetrated the unknown forests of the New World in search for the precious metals. The conquest of India and South Africa, the settlement of California, Australia, and Alaska, all

*A paper read before the American Mining Congress at Joplin in November, 1907.

originated in the desire to obtain golden treasure, and the search for gold has carried the torch of civilization throughout the world. It is a curious fact, however, that the English-speaking people alone produce today nearly seven-eighths of the world's production of gold.

Asia possesses a remarkable capacity for the absorption of gold and silver and much of the precious metals sent there seems to be permanently withdrawn from the stocks available for money. It may be that much of this is hoarded or buried in the ground and lost, becoming practically non-existent. Asia has been called the sink of gold and silver, and its ability to absorb and lose these metals has been a subject of remark ever since the time of Alexander the Great.

Among all civilized peoples, gold and silver have derived their chief importance from their use as money. In the earlier period, the first money in use among undeveloped or isolated communities consisted of skins, salt, shells, soap, slaves, cattle, sheep, olive oil, tobacco, iron, tin, lead, copper, nickel, and platinum. In such communities transportation facilities were rudimentary, commercial operations were limited to small areas and carried forward slowly on a small scale. Money has been defined as that which passes from hand to hand throughout the community in final discharge of debts and as full payment for commodities or service, being accepted without reference to the character or credit of the person who offers it.

For many reasons, the metals finally superseded all other forms of money, and gold is gradually displacing all other metals and driving them from the field. Cattle die, iron rusts, slaves grow old, but gold and silver, and more especially gold, fulfills all the requirements of money better than anything else. Gold is of small volume compared with its weight and value; it is of uniform quality, easy of transport, easily guarded, readily divided and reunited without loss. Its identity is perfect, it is easily recognized and is beautiful, brilliant, and durable almost to eternity. It is probable that gold which was in use at the time of Solomon is in active service still. Gold does not deteriorate with storage or time and its firm and compact texture makes it difficult to wear away.

Until within the last generation, the value of gold bore practically no relation to its cost of production, but depended only on the total quantity in the hands of mankind. For ages its value changed only by slow degrees. In ancient times, strong nations plundered weaker races of their hoards of the precious metals and more modern powers have followed their example, using it without regard to the cost of production. It is probable that gold and silver were used as money long before the metals were stamped and coined and this was ultimately done in order to save the trouble of weighing and assaying for each transaction. The talent, shekel, etc., in the Hebrew records, all refer to the use of money by weight, while the English pound and the Spanish *peso* and *onza* all indicate weight. The word coin itself, meaning a wedge, indicates a primitive method of using money. Our word pecuniary, now applied to metallic money, originally meant cattle, and from the custom of counting cattle comes our present designation of money as capital, meaning heads.

The coinage of gold and silver was adopted at first by private individuals and cities to guarantee originally the fineness and afterward both the weight and purity of the metals. In Rome, under the Empire, however, coinage became the exclusive privilege of the Emperor. Herodotus attributes the first use of coined gold and silver to the Lydians, but it is probable that the real date was much earlier. As civilization advanced, the use of

gold and silver as money became a modification and improvement on the earlier methods of simple barter, and gold presented us with a desirable standard of comparison with which all other values, even including future obligations, are compared and measured.

Gold, however, is not absolute standard, such as the pound weight or the metre length, but is simply a relative measure of value as steady as anything we have. In other words, it is possible for gold itself to change in value. The control of weights and measures has always been one of the great functions of governments and is one of the necessary prerogatives of national life and honor, and every honest government since the dawn of history has protected the use of gold and silver with the best guarantees it could devise, both as regards its weight and its purity. The reputation of any government can be more readily and more seriously injured by the defects or debasement of its currency than in any other way. Changes in the value of gold are reflected immediately in the price of some commodities and very slowly in the price of others, particularly in wages and returns from investments bearing a fixed rate of interest. In any change in the value of gold, the poorer portion of the community suffers most; employers and merchants are quick to discount any change, and they adjust themselves to new conditions more readily than the wage-earning classes. Those living on the interest paid on bonds or mortgages cannot adjust themselves to the change at all, and are paid a fixed amount of gold, irrespective of its value. The wealth stored up by all communities in interest-bearing bonds, using gold as a fixed standard for future payments, is affected enormously by changes in the value of gold and the result of such changes on the business commerce of the world is hard to realize.

Although gold is mentioned in the early literature of every race, it is difficult to learn its ancient value as measured in terms of food and wages. It is certain, however, that its value in early times was a thousand times greater than it is today and that this value had been decreasing slowly until the discovery of America. In the thirteenth century, it was estimated that the total stock of gold and silver in Europe was approximately \$6 per capita, the population at that time being 30,000,000. Only one-half of this gold and silver was coined; no banks or negotiable paper existed. Good roads were few and there was little peace and no credit. From the fifteenth to the eighteenth centuries enormous quantities of silver were obtained by Europe from the New World and the gold supplies of Japan and India were gradually transferred to Europe until, by the end of the eighteenth century, there was estimated to be ten times as much of the precious metals in Europe as in the thirteenth century. As before mentioned, previous to the eighteenth century, the value of gold bore practically no relation to its cost of production, but depended primarily on its peculiar fitness for money as a basis of value and on the total amount in use. Before 1840, the annual production of gold bore such a small relation to the total quantity existing, that its cost of production from year to year never materially affected the value of the whole quantity in use, and Humboldt, in a remarkable article on the production of gold, written in the early part of the nineteenth century, predicted that these conditions would exist for all times.

In 1815 the annual production of gold in Russia increased very largely and all Europe was alarmed. In Holland, the desirability of a single silver standard was widely discussed. In the Netherlands, gold was demonetized in 1817 and the silver florin declared to be the sole legal tender. Belgium soon followed suit. In 1847 a run occurred on the Bank of England. In 1848 the Bank of Austria stopped payment, and when in 1849 California

began to give its golden treasury to the world, the golden panic reached its height. In 1857 Russia suspended payments in specie, and the German States, including Austria, adopted a single silver standard. Chevalier advised the Government of France to demonetize gold and Cobden, in England, seriously recommended a return to barter. After this increased production of gold, however, the actual course of events reversed all predictions, prices rose everywhere, and the world entered upon a period of unexampled progress and prosperity, and in 1871 the German Empire finally adopted the gold standard and discontinued the mintage of silver, being followed in 1873 by the United States and France and by the Latin Union, Holland, and Belgium in 1875.

It is, however, owing to the utilization of the power of steam, during the past 50 years, a cause which has wrought so many changes in human affairs, that the use of gold as money has been almost completely revolutionized. The amount of gold in the world, which, before 1850, had increased slowly and had barely kept up with the increase in population, suddenly increased by leaps and bounds. It became twice as great, ten times as great, and by the year 1900 the annual production of gold became approximately 400 tons, or 22 times as great as in 1800. Since then the production has increased with equal rapidity, until now it has reached 680 tons per year, and it is estimated by competent authorities that in the next 16 or 17 years the amount of gold in the world will be doubled. In other words, the amount of gold which has taken the entire civilized world thousands of years to accumulate, will be doubled in our lifetime. In addition to this, the spread of knowledge, the development of railroad and ocean transportation, the use of the telegraph and the growth of modern banking methods, have all increased the efficiency of gold as money. This has also been aided by the greater confidence which races and individuals now have in each other, which is one of the great underlying features of modern civilization, and a golden dollar can be made to do more than a hundred dollars did a century ago. These rapid changes are being accompanied by others equally remarkable; money can now be transported throughout the world at a speed undreamt of by our fathers, cheaply and with almost perfect safety. It has been still further facilitated by international and other clearing-houses, where transactions involving the use of the measuring power of gold are affected to an enormous extent by telegraphic communication without actually moving or handling the gold itself at all. All this has tended to make gold cheaper. On the other hand, the enormous scale on which commercial enterprise is now being carried forward, the improved mode of living of whole races, the demands of industry for money along so many different lines, the money needed in the building up of new countries and the funds required for war purposes, all tend to keep up the price of gold.

Underlying all these activities, however, remains the commodity gold, upon which all our calculations are based and the fact must always be remembered that gold as money is only a measure of value by virtue of its relation to the value of other commodities. In all countries, apprehension is felt when gold is exported and this perhaps is an unconscious admission that the quantity of gold in any community exercises an important influence on its industries and its commerce. The use of gold as money is primarily a modification of the system of barter or exchange and is to a lesser degree than any other material human standard, a creation of law. At the same time it must be the effort of government to limit and define its use with precision.

In spite of the present efficiency of mining operations

and the improvements and economies in metallurgical processes, it is probable that the demands of industry and commerce which are increasing so enormously, will ultimately increase the value of gold, or at least prevent its depreciation to any serious extent below its present level. Whether the value of gold will change materially in the future or not, is a subject that deserves the earnest consideration of every statesman. Although this subject has received the attention of thinkers in all ages, the issues have usually been hidden by the personal interests of rulers, or of those controlling the supplies of the precious metals, or by the desire of governments to secure the greatest benefits for their own coinage. It is seldom that the people of any community have had the opportunity to investigate the relation of this question to their own welfare, and it is not improbable that some of the inequalities of our social system may be traced directly to this cause. The growth of organized society depends largely upon the development of exchange, and exchange is impossible without money. If we must continue to use gold, it is of prime importance that our government should be able to form an accurate judgment regarding its present and future value because this, the basis of our monetary system, fixes the value of much of the property in our own country over long periods of time.

A Chance to Get Rich.

[A friend at New York sends us the following copy of a letter received lately by him. To sell a mine "as a hole" does not usually "suit the buyer." Many a truth is conveyed by a misspelt word.—EDITOR.]

Dear Sir I see your ad in the Mining Press, now dew you ever handle enny mines fore sale, ifso I have some good gold mines In californnia, fore sale some with mashenery on them, and free milling ore, and the prise ranges from \$15,000 to \$250,000 also I have a good gold mine in Georga, free milling ore, and the oner was offered at one time \$150,000 cash fore the mine but sense that the oner has Died and now the widdo is offering the mine fore \$125,000 to make a Quick sale as she is getting old ond wants to settle up her bnisness and retire, I also have 3 good copper mines In this state, one with 25 clames and the other with 30 now there is only the develope work done on them, the ledge shows on the serfas, 100 foot wide and about ¼ mile long and the prise is \$75,000 fore one and \$200,000 fore the other, now the oner will still keep a intres in the mine if the buyer dont want to buy out rite, ore he will sell as a hole to suit the buyer. now I will alow you a 5% commission on enny sale that you can make hoping that you can be able to dew some buisness I remain yours truly. awating your reply.

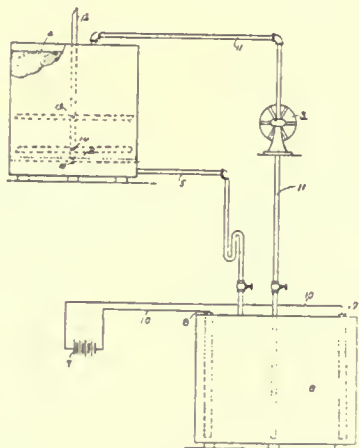
JOHN SMITH. Oakland.

THE REPUBLIC OF MEXICO, according to a statement published recently by the Mexican Department of Fomento, contains more than 1,000 mines operated mainly for copper production. These are located in the different States as follows: Jalisco, 302; Sonora, 234; Michoacan, 95; Lower California, 65; Chihuahua, 53; and Durango, 51. In proportion of production tonnage, however, Sonora leads, while Lower California is second; the mines in the State of Jalisco are small producers.

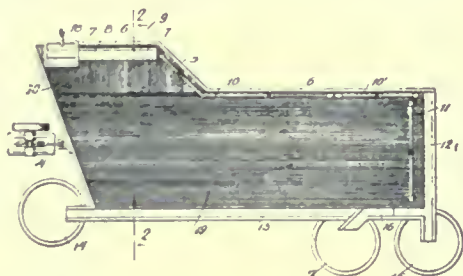
WHEN SHARPENING AND TEMPERING DRILLS leave the sets on the forge until all are finished, then heat the bits cherry red, but not the body of the steel; dip in clean water, moving slowly down, then out, leaving heat enough in the body of the drills to toughen the bits by starting temper to show color. Check color by cooling in the slack tub.

MINING AND METALLURGICAL PATENTS.

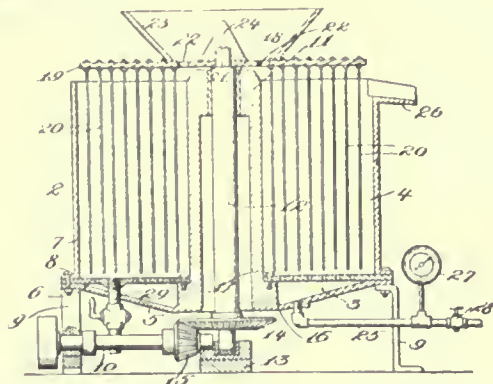
Specially Reported for the MINING AND SCIENTIFIC PRESS.

PROCESS FOR EXTRACTING GOLD AND SILVER FROM ORES.—No. 871,766; Gilbert Gurney, Berkeley, California.

The process of extracting the values from sulphide ores, which consists in first subjecting at normal temperature and without pressure the raw ores to the action of a solution containing the higher or perchloride of a metal of two or more valences, together with a chloride of an alkali metal and a free mineral acid, and afterwards precipitating the values from the resultant solution.

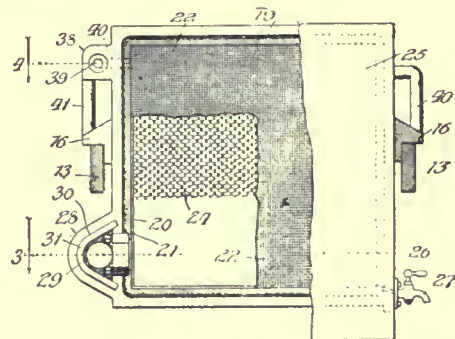
ORE-CONCENTRATING TABLE.—No. 871,369; Alfred Schwarz, New York, New York.

A concentrating table having corrugations, said corrugations being sufficiently small in transverse section to create zones of liquid substantially quiescent in planes transverse to the corrugations, said zones being of sufficient extent to receive the metallic values and protect the same from transverse currents of wash liquid, means for differentially reciprocating the table, and means for supplying wash water thereto.

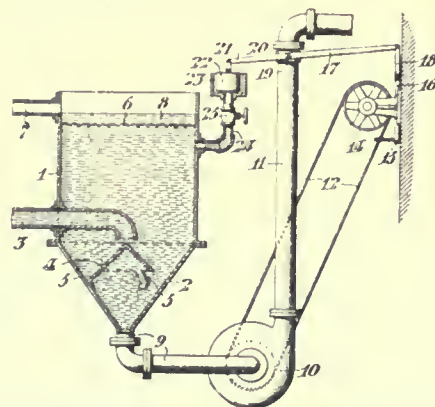
CONCENTRATOR.—No. 871,546; Calvin H. Wilkie, Douglas, Arizona.

In a concentrator, a tank comprising a bottom, a perforated diaphragm, and a shell suitably connected together, the diaphragm and bottom being separated to provide a pressure chamber, and the diaphragm and shell constituting together a separating chamber, said bottom having an impermeate tube rising therefrom, extending through, and supporting the central portion of the diaphragm, a shaft

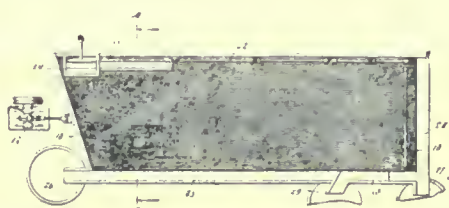
extending through the tube, means connected with one end of the shaft for rotating the same, a cone fitted to the other end of the shaft, an agitating head rotative with the shank and located between the cone and tube, and agitating devices connected with the head and extending into said separating chamber.

FILTER-PRESS.—No. 872,008; Frederick W. von Oven, Aurora, Illinois.

In a filter-press, the filter frames having inlet-ports in the junctions between them, and provided with ears containing openings forming a feed-passage common to said ports. In a filter-press, a chamber forming element consisting of a frame comprising a rim having inwardly beveled edges and a flange affording shoulders extending about its inner edges, screens abutting against said shoulders, and an open-work flexible mat interposed between the screens, and filtering cloth covering the frame sides.

DEVICE FOR SEPARATING MATERIALS HELD IN SUSPENSION BY LIQUIDS.—No. 872,033; Charles N. Waite, Wilmington, Delaware.

In a separating device, the combination with a tank; of a screen dividing said tank; an inlet pipe for unseparated materials, arranged on one side of said screen; an outlet for separated residue arranged upon the same side of said screen; an outlet for strained liquid arranged on the opposite side of said screen; means for effecting the discharge of the separated residue; and means responsive to abnormal increase of pressure beneath the screen for actuating the controlling mechanism of said discharging means.

METHOD OF CONCENTRATING ORES.—No. 871,368; Alfred Schwarz, New York, New York.

The process of concentrating ores consisting in sizing the ore and flowing each size in a pulp current over bodies of liquid restrained from movement in places in the direction of gravital flow, inclosing the values in the quiescent liquids, and differentially agitating the whole to promote settling, and to convey the settled values in directions other than that of gravital flow, and gravitally washing away the gangue.

Carbons.

Written for the MINING AND SCIENTIFIC PRESS
By JACQUES BASZANGER.

The carbonado or black diamond is one of the hardest substances known, being sometimes harder than the crystallized diamond. It is, however, unsuitable for cutting into gems, because of its opacity, and its being amorphous. Carbonado was first successfully used by the French engineer, Lechot, in the drills for boring holes for blasting in the St. Gothard tunnel. At present carbonado is largely employed in diamond-drilling, in connection with which it is one of the principal items of cost.

Carbonado is obtained in the province of Bahia, Brazil, in La Chapad and Lavras districts, where it is mined from stream beds and other alluvion. The miners sell their finds to agents of exporting firms in the city of Bahia. Some very large stones have been found, among others one of 1,100 carats about 25 years ago; also one of 1,700 carats and in 1895 a gigantic stone of 3,078 carats, or 615 grams, which was sold by me. This stone was purchased for \$32,000; at the present time it would be worth about \$275,000. Several stones of 400 to 800 carats have been discovered during the last ten years, and stones of 100 to 200 carats are frequently found.

Previous to 1870, carbonado was practically valueless. From 1870 to 1872 it was employed as an abrasive for cutting and polishing the white gems, and thousands of carats were sold at 50 cents per carat, to be crushed into powder for this purpose. A few years later, when carbonado was employed in diamond-drilling, it sold at \$2 to \$4 per carat, and then rose gradually to \$10, at which price it remained until 1895, after which it advanced by leaps and bounds to \$50. The price fell back to \$25, but rose again to \$95 per carat, at which figure it now stands.

The high price now prevailing is due to the decline in the supply of carbonado during the last ten years, while the demand has increased. When diamond-drilling is resumed more extensively on the Rand, it is expected that it will be even more difficult to supply the demand for carbonado. Bearing upon this subject, it is interesting to remark that in putting down the drill-hole at Rybnik, in Upper Silesia, which attained a depth of nearly 7,000 ft., upward of \$25,000 worth of carbons was consumed. The carbon settings for a drill-bit are expensive. Bits as large as one foot in diameter, set with \$5,000 to \$8,000 worth of carbon, are frequently employed in Europe.

OCCURRENCE OF DIAMONDS.—Volcanic pipes in which diamonds are found are not peculiar to South Africa. Similar formations have been discovered in New Zealand and quite recently in Connecticut, but it is only in South Africa that the diamond deposits have attained any economic importance. The so-called pipes in which the diamonds are found may be considered to be the material filling the craters of extinct mud volcanoes. For a long time it was supposed that diamond mines were only to be found in the neighborhood of Kimberley and in the district farther to the east, in the Orange River Colony, where the Jagersfontein and Koffyfontein pipes are situated. Within the last few years, however, diamond pipes have been found in many other parts of the country, and among them may be mentioned the Premier, Montrose, and Schuller pipes near Pretoria, in the Transvaal; the Lace and New Randfontein Reefs pipes near Kroonstad, and the Victor pipe near Boshof, in the Orange River Colony; while the Peizer, New Weltevrede, and Frank Smith have been discovered to the northwest of Kimberley.

Decisions Relating to Mining.

Specially reported for the MINING AND SCIENTIFIC PRESS.

While a miner, like other servants, was bound to take notice of patent defects in the entry of the mine where he was working, the law does not require him to make an examination for hidden defects, but he may assume that the owner or operator had used reasonable care not to endanger his position by other workings.

Superior Co. v. Kaiser, (Ill.) 82 Northeast, 239, Oct., '07.

The rule that a servant or a miner assumes the ordinary risks incident to the work in which he is engaged, is based on the supposition that the master has performed the duties of care, caution, and vigilance which the law places on him.

Superior Co. v. Kaiser, (Ill.) 82 Northeast, 239, Oct., '07.

The failure of the owner and manager of a mine to thoroughly examine and inspect the face of a certain cross-cut was held to constitute such negligence as to permit a miner to recover for injuries received while working in an entry near to such cross-cut, and that such cross-cut was developed in advance of and so close to the rib and face of the entry as to loosen, crack, and weaken the rib and face of such entry at the point where the miner was at work and where he was injured. Such miner was not charged with contributory negligence where the fall of coal which injured him was from the face of his entry, which, on examination, appeared to be safe on the morning of the accident.

Superior Co. v. Kaiser, (Ill.) 82 Northeast, 239, Oct., '07.

A contract by a mining corporation to issue stock to a certain person in payment for his services in aiding another to dispose of the stock of the corporation and in making assays was illegal under a constitution prohibiting any corporation from issuing stock except for labor done, or money or property actually received; and it was the duty of the court in an action on such contract to refuse to enforce it as against the corporation though the corporation failed to plead such illegality.

Rogers v. Gladiator Co., (S. Dak.) 103 Northwestern, 86, Aug., '07.

A deed granting all the oil and gas under a certain tract of land, with the exclusive right to enter at all times for the purpose of drilling and operating for oil and gas, but limiting the estate to a term of years and as much longer as oil or gas should be found in paying quantities, and stipulating for penalty in case of delay in drilling, and further providing for the delivery into pipe lines for a certain share for the guarantor of all the oil produced, and for the payment of a yearly rental for each gas well, was held not to pass the title to oil and gas in place; and was in legal effect only a mining lease and that the title to the oil and gas in place remained in the grantor.

Toothman v. Courtney, (W. Va.) 58 Southeastern, 915, Oct., '07.

Under the statute an adverse action must be commenced within 30 days after the filing of the adverse claim; and such time is determined by the statute providing that a civil action shall be commenced by the filing of the complaint and the issuance of a summons, etc.

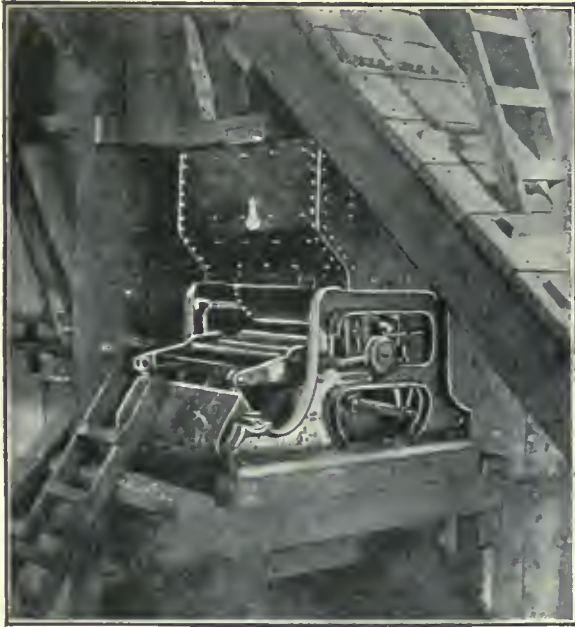
Harris v. Helena Min. Co., (Nev.) 92 Pac. 1, Oct. '07.

A government mineral surveyor, appointed under the United States Statutes, Section 2334, was not an officer, clerk, or employee in the General Land Office, within the meaning of Section 452 of the United States Statutes prohibiting certain persons from obtaining title to government land; therefore such government mineral surveyor was not disqualified from locating a mining claim under Section 2207 of the United States Statutes.

Hand v. Cook, (Nev.) 92 Pac. 3, Oct. '07.

Richardson Automatic Weighing Machine.

While the ore is carefully sampled in the mine, the tonnage estimated, and the value of the ore in the stopes carefully calculated, and while the ore, concentrate, and tailing are accurately sampled and then carefully assayed, the weighing of the ore, which is equally as important as these other steps in ore treatment, is left to pure guess; at least such is the case at most mines and mills. The amount of ore mined is generally calculated from the average weight



of a car of ore and the number of cars pegged by some surface man. Each of these factors is liable to error, for the number of cars may be pegged incorrectly, and the average weight of the carload varies from day to day.

The weight of a carload varies owing to two quite different causes, one is natural, the other human. The amount of ore, coming from different stopes, is apt to change each shift. The weight of the loaded cars from each stope differs because the ore itself weighs more in some stopes than in others, and also because in one stope more waste rock gets mixed with the ore than in another. Both of these factors affect the weight, but their effect is insignificant compared to the human cause of variation. Not only does the weight of the load vary with the different trammers, who load it, and even with the difficulty of loading at different chutes, but it varies with the time of day, for instance, whether the car is loaded on day-shift or on night-shift. Even on day-shift the weight varies with the hour. The trammer underground knows when the foreman or superintendent is liable to be about the mouth of the shaft, and they know almost immediately when the foreman comes underground to go through the stopes. A car three-quarters loaded runs easier than a full one, and it makes a much bigger showing for the 'mueker,' who is shoveling into the chute: the partly filled car counts as much as a loaded one on the tally-board. So it is safe to say that carloads vary even with the hour of the day. Then when night comes and only the shift-boss is in charge—he, who is trying to get out more 'dirt' than the boss on the other shift—do you think the trammers are over careful to fill the cars?

So one sees that at most mines the whole basis on which the calculation of the tonnage mined depends, is uncertain. Yet from such data the percentage of extraction is calculated and compared with the theoretic percentage obtained from the assays. It does seem that the amount of ore broken,

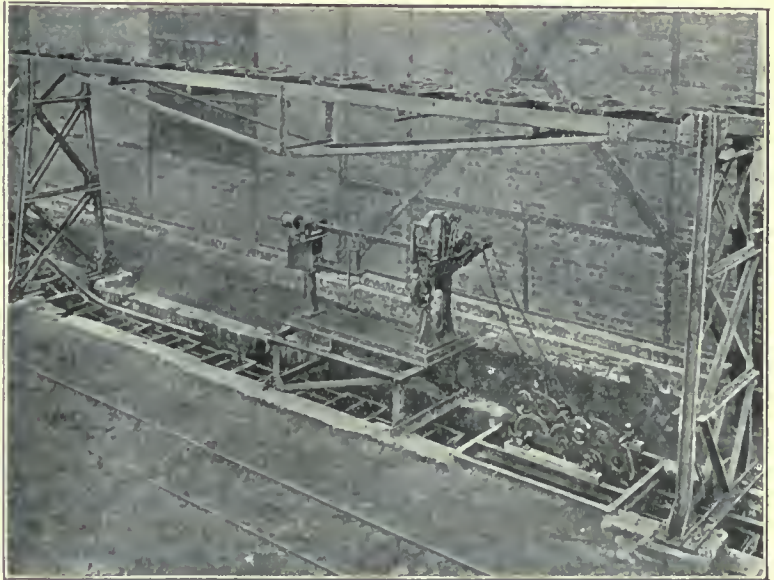
or that treated at a mill, is worthy of more accurate determination. If it is worth while to check the theoretic percentage of extraction (and it surely is), then it is worthy the expense of checking it and not half-checking it. Gradually mining men are beginning to realize this fact. Many of the mines of the Rand are equipped with automatic weighing devices, several have been installed at mines throughout Europe; some are in use at coal mines in the United States, and a few have been installed at the metal mines.

Among the simplest of these devices is the Richardson automatic weighing machine, manufactured by the Richardson Scale Co., of New York. Richardson automatic weighing machines have been in use for several years in flour mills, cotton-seed manufactories, grain-elevators, sugar-refineries, etc.; but now their devices have been adapted to the work of weighing coal, ore, and concentrate, in short, any fragmental material. All their devices weigh by a system of equal beams, the same principle as is used in assay-balances and all accurate weighing devices. Three of their machines are especially adapted to the work about mines, mills, and smelters.

Their automatic tracks scales are automatic. No movement of a hand-lever or a hand-wheel is necessary to start the operation. The whole device is enclosed in a locked casing so that it cannot be tampered with. Only two seconds is required for a weighing having an accuracy within two pounds. This machine either registers automatically the weight of each loaded car or it adds up the weight continuously.

The automatic conveyor scale, made by the same firm, automatically weighs ore or coal transported either in a bucket or a belt-conveyor. This scale weighs each section (of an arranged length) of the conveyor passing past it and no breaking or cutting of the conveyor is necessary, as is the case when the conveyor dumps into a weighing-hopper.

The Richardson automatic ore scale is in operation at the Daly West mine, at Park City, Utah, where it has been used several years. This scale weighs an average of 400 tons of ore every 24 hours. It has given entire satisfaction to the management. By means of the automatic register

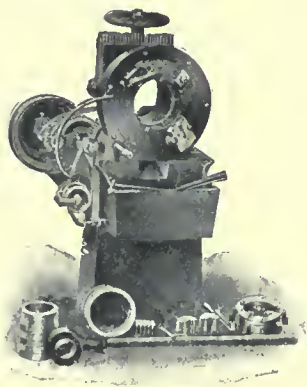


the exact quantity of ore that has passed through the machine can be seen at a glance. This scale is of the hopper-weighing type but the principle of equal-arm balancing is incorporated into its design. The ore from an elevator or from a bin dumps into a receiving hopper equipped with a reciprocating plunger which feeds the ore into the weighing hopper. The weight of the ore in the hopper, by means of a system of levers, gradually closes two gates until a final dribble balances the beam; then the hopper dumps only to repeat the process. Any clogging of the scales is prevented by the plunger feeder. This scale is especially adapted to weighing in mills and smelters; it is generally placed just below the crushers. These scales can

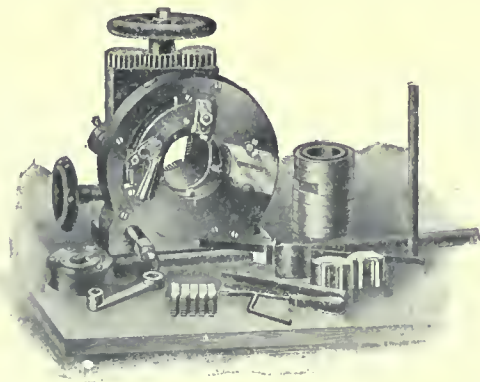
also be used to weigh the coal fed to the boilers either by hand-stoking or by automatic stokers. All these devices are more fully described in the interesting catalogue recently issued by the company. This catalogue will be gladly sent to interested people by the Richardson Scale Co., 5 Park Row, New York.

Pipe-Threading Machines.

Prominent among the makers of pipe-threading and cutting-off machines, is the Merrell Manufacturing Co. of Toledo, Ohio. Two types of machines made by this firm are shown in the accompanying illustrations. The first represents the portable hand machines, No. 5, 6, 9, and 11. The power is applied either by crank or ratchet lever to the shaft of the pinion, which engages the geared wheel enclosing the



dies. As the gears and bearing parts of the machine are housed, the difficulties due to dust and chips are obviated. All machines have a rapidly adjustable die-head and cutting-off knife; the chasers are set by graduation to any size desired, and may be released from threading while in motion, opened to allow the pipe to be cut, and closed instantly, one set being used to thread several sizes of pipe. The chasers can be sharpened by grinding. It is claimed for these machines that they do better



and more rapid work both in threading and cutting than any other hand machine on the market, and that they have a greater range of work and permit of quicker changes in size of pipe. The second illustration shows the hand and power machines No. 5½, 6½, 9½, and 11½. These machines are the portable hand machines mounted on a base and driven with compound gears with a cone-pulley, being so arranged that either hand or power can be used, while it is possible to take the machine from the base and use it as a portable hand machine. These two types are described at length in Bulletins No. 18, 19, and 20, issued by the company. These machines are sold and carried in stock by the Pacific Hardware & Steel Co. of San Francisco.

GRADUATES of the MICHIGAN COLLEGE OF MINES held a reunion at Houghton on Thanksgiving day. Twenty out of the 33 graduates on the Mesaba range attended and the affair was most successful. A. F. Benson was toastmaster and the following responded to toasts: D. C. Peacock, 'Possibilities'; C. K. Quinn, 'Michigan College of Mines'; I. J. Shields, 'Mining in Peru'; W. R. Van Slyke, 'Precision'; J. W. Van Evera, 'Recognition of Thanksgiving'; V. H. Rakowsky, 'A Higher Plane for the Mining Engineer.'

Commercial Paragraphs.

THE COMPRESSED AIR MACHINERY Co. reports the sale of a Word Brothers drillmaker and sharpener this week to the Pittsburg Silver Peak Gold Mining Co., at Blair, Nevada.

THE Guanajuato Consolidated Mining & Milling Co., Guanajuato, Mexico, is installing a RIDGWAY filter-press, which is said to be the first of these presses installed on this continent.

THE ECLIPSE DRILL SHARPENING MACHINE & MFG. Co., of Denver, recently sold one of their large drill-sharpening machines to the U. S. Government for use in the Gunnison tunnel at Lajane, Colorado.

ALLIS-CHALMERS Co. has engaged for its office in St. Louis, Mo., a new suite of offices, 1,302-1,304 Third National Bank Bldg., where F. L. Bunton, the district manager for the company, and the salesmen of his staff, will be prepared to receive visitors after January 1, 1908.

L. S. PIERCE, 1650 Champa St., Denver, Colo., patentee and manufacturer of the Pierce amalgamator, reports the following sales: Black Bear Mining Co., Telluride, Colo., four 20-ton machines; Smuggler Union Mining Co., Telluride, Colo., three 20-ton machines; Round Mountain Reduction Co., Nevada, one 50-ton; New York & Promotion M. Co., Quartzburg, Arizona, three 5-ton; through Fairbanks, Morse & Co., three 25-ton extra length machines for shipment to the Jenny Gold M. Co., Gold Spring, Utah. The Smuggler Union Co. already has 13 of these machines in use in their mill, which have been giving excellent satisfaction. These machines either take the place of plates or are used below plates. In a number of mills they have been installed after completing the mill and are then placed below the plates.

Books Received.

'Plane Surveying,' by John Clayton Tracy, Assistant Professor of Structural Engineering, Yale University. First Edition, 1907: John Wiley & Sons, New York; 16 mo. XXVII and 792 pp.; morocco, price \$3. This, the latest book on the subject, is a text-book and pocket-manual combined. It combines many of the admirable points of 'Johnson's Theory and Practice of Surveying' with others from Pence & Ketcham's 'Manual of Surveying'; in addition it contains much first-hand information. It is a book for beginners whether in college or in practice. Field work is treated in 360 pages; office work, 176 pages; care and adjustment of instruments, 82 pages. It gives a systematic treatment of note-keeping and finishing maps.

Catalogues Received.

THE WESTINGHOUSE MACHINE Co. of Pittsburg has issued 'Catalogue P,' describing and illustrating the Storage Batteries made by it for portable service.

THE TRAYLOR ENGINEERING Co. of New York now has ready for distribution a new catalogue entitled 'The Traylor Concentrating Table.' This catalogue not only describes the recent improvements in the construction of that table but it also describes less completely other milling machinery and some smelting furnaces, manufactured by that company.

Publications Received.

Bulletin No. 314, 'Report on Progress of Investigations of Mineral Resources of Alaska in 1906,' by Alfred H. Brooks and others, has been sent to us by the United States Geological Survey.

Dividend.

On December 4, the Bunker Hill & Sullivan Mining & Concentrating Co. paid dividend No. 123 of \$90,000. This makes the amount of dividends paid this year \$1,950,000, and the total to date \$9,816,000.

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TABLE OF CONTENTS

Editorial:	Page.
Notes.....	791
A Question of Policy.....	792
The New Alchemy.....	793
By the Way	794
General Mining News	796
Special Correspondence	801
Johannesburg, Transvaal.....	
London.....	
Butte, Montana.....	
Salt Lake, Utah.....	
Denver, Colorado.....	
Torreón, Mexico.....	
Concentrates	806
Discussion:	
Assessment Work.....James Brindley Rowley	807
Hang-Fire.....F. T. Howes	807
A Sampler.....Frank W. Oldfield	807
Prospecting With the Diamond-Drill.....	
.....E. G. Tinnebo	807
Wall Street.....Albert L. Clark	808
Drill-Sharpener.....T. H. Proske	808
Volcanic Ash.....Hiram W. Hixon	809
The Fairmont Explosion.....S. H. Brockunier	809
Professional Customs.....	
.....George W. Maynard, Chas. J. Lyser	810
Esperanto.....Arthur Baker	811
Articles:	
Japanese Mining Laws.....	811
Mining Under Adverse Circumstances.....	
.....E. McCormick	812
Improvements in the Homestake Mill.....	812
Cobalt.....Frank C. Loring	814
Prolonging the Life of Mine-Timbers.....	
.....John W. Nelson	816
The House of Braun.....	820
A New Mine-Car.....	820
Mining and Metallurgical Patents	819
Decisions Relating to Mining	815
Departments:	
Personal.....	795
Market Reports.....	795
Catalogues Received.....	820

Editorial.

RECUPERATION from the effects of speculative excesses is likely to be rapid, for the resources of the United States give it a resilient strength astonishing to the old world of Europe. For instance, the total value of the farm crops for 1907 is estimated at \$3,404,000,000, or an increase of \$478,000,000 over 1906. The valuation is helped by the failure of crops in foreign lands and the consequent high prices of cereals. A little matter of \$478,000,000 is an excellent tonic for financial debility.

IN REGARD to assessment work on mining claims, we note that the Senate has passed the bill suspending the necessity for such work for the year 1907, and it is likely that the bill will be made law in time to serve its purpose. That purpose we believe to be a mistaken one and in the interest of companies owning unpatented claims rather than in the interest of our friend the prospector, whose credit is still as good as it was before the recent financial unpleasantness.

THE BAD SEASON of the Manhattan Opera House at New York, and the passing of the De Beers dividend at London, are signs of the troublous financial times. Opera and diamonds are not necessities, and the rich forego both when incomes decrease. In regard to De Beers we remember that Cecil Rhodes, about five years ago, when presiding at the annual meeting of the diamond mines consolidation, said that they could make diamonds as cheap as glass by over-production, but as long as women were vain and men were foolish, the dividends would be forthcoming. Vanity and foolishness have not passed from off the earth, but a rival diamond company—the Premier, at Pretoria—spoilt the business of the Kimberley mines, and has caused the dividend to be passed, despite an adjustment of the monopoly.

OUR DENVER correspondent refers to the fact that the mining community of Summit county, Colorado, is urging the preparation of a report on the local geology and that the United States Geological Survey is being importuned to do this work. We are glad to second this suggestion, for the investigation of the geology of the district around Breckenridge is likely to prove useful in a wide sense. To many people Breckenridge is celebrated for the beautiful specimens of native gold that have been on exhibit at national expositions. To geologists it is known that Farncomb hill, whence come these specimens, affords an interesting example of vein structure, for the ore occurs in Cretaceous shale where penetrated by eruptives belonging to the same period as the quartz felsite of Leadville. But the district has many other forms of ore deposit, besides the gold-bearing

placeers that led to the first mining forty-six years ago. No part of the Rocky Mountains affords better opportunity for the study of economic geology and we hope the Director of the Survey will be able to arrange for a scientific investigation.

FATALITIES involving the loss of hundreds of lives, have occurred in rapid succession at three coal mines. Whether they were wholly unavoidable or due to carelessness, no one can say until a thorough investigation has been made. We publish a letter from Mr. S. H. Broekunier concerning the explosion at the Fairmont mine in West Virginia and his letter emphasizes the perfunctory character of the inspection made by State officials; in fact, it reminds us a good deal of the bank commissioners in California, who are incompetents appointed by the Governor as a reward for political services of a disreputable kind. When these accidents in mines take place, it is pitiful to find that they are due too often to criminal carelessness such as ought to lead to the arrest of both the inspectors and the managers. The facts are obscured by the heroism of the rescuers and public sentiment is placated by being informed that the victims are not Americans, but Russians or Austrians, just as if the sunlight were not as sweet to one as to the other. We are reminded of the news item announcing the loss of the *Mary Lane* off the coast of Massachusetts, it being stated in the despatches that 14 souls and two Chinamen were lost! Is it provincialism or inhumanity that causes people to make such queer distinctions between the relative values of human life?

AMONG the beneficent activities of the Federal Government, that of the Forest Service is notable. We take pleasure in publishing an article by Mr. John W. Nelson, of that department, on the experiments to determine how best to prolong the life of mine timbers. It is noteworthy that our correspondent at Johannesburg refers to the recognition of afforestation, or planting of trees, as important to the future of mining in South Africa. America is better blessed with forests, but the tremendous destruction of them threatens the country with a serious loss in the near future, unless steps are taken to remedy the deforestation. To the public spirit and intelligent energy of Mr. Gifford Pinchot, as Forester, is due much of the credit for the valuable work now being done by the Forest Service of the United States, both in educating people to national thrift in this regard and to actual protective measures calculated to prevent indiscriminate cutting of trees and forest fires.

THE PUBLICITY MANAGER for an important machinery house states in a circular that the striking of two veins of rich ore occurred subsequent to the placing of an order with his firm for a mill. Moral: Order a mill, and a mine shall be forthcoming by the time you are ready for it. Joking apart, such things have been done and miracles have happened. Moreover, there still lingers the idea, among people of a certain kind, that if you buy machinery from particular machinery

houses, you will get dividends from your mine. A facetious agent once promised that every mine using his pulverizer would prove a bonanza. In the old days directors from New York and London would call on Mr. William Chalmers at Chicago and order a 40-stamp mill complete, engines and vanners included, much as they would go to a trusty head waiter and tell him to set up a nice luncheon for two. Sometimes it might be added that the mill was to be "just like the one built" for the Homestake or the Montana company, the idea being that the equipment that suited a real bonanza would be right for a supposititious treasury of wealth in course of development. Those days are gone. There are more makers of machinery and better machinery, there is more care in selecting the right equipment and the result is a closer adaptation of the machinery to the ore it is intended to treat. Sensible investors or speculators take advice as to the manner of reduction suited to the ore produced at their mines, and mills are ordered not like a box of cigars or a French dinner, but upon the cautious investigation of consulting metallurgists, who get the different parts from the different firms that make specially manufactured articles. Occasionally the ore is expected to suit the mill and the caprice of the mine-owner, but nature proves refractory and money is exchanged for experience, the latter being less readily convertible into currency and therefore, in times like these, less desirable.

A Question of Policy.

TO stop development or not, that is the question. By reason of the low prices of copper and lead, it is for directors and managers to decide whether on the one hand they shall stop development and thereby minimize expenses while extracting ore in reserve so as to maintain good profits or, on the other hand, continue development, diminishing production meanwhile, so as to conserve the ore for the time when the metal market improves. Two extremes of policy are illustrated by Lake Superior and Butte. At the copper mines of the Lake country the operations are maintained steadily, regardless of the vagaries of the metal markets. Development and extraction proceed at their usual ratio no matter whether Secretan, the Amalgamated, or the United Metals Selling Co. is trying to set aside the laws of supply and demand. At Butte, on the contrary, sweeping reductions in the scale of operations, the closing down of big mines, and the cessation of smelting operations are ordered, in the expectation, apparently, of restoring the metal market to a healthy condition. Changes in the policy of the copper mining companies are made in a lordly way, highly disconcerting to local industry. It seems to us that two obligations are involved, one to the shareholders, that is, the owners of the mine; the other, to the local community. The first requires that the maximum profit be made. Is it made by violent changes of policy? The manager of a big mine gradually gathers a number of efficient employees and develops a system based upon the usefulness of such a body of men. They

settle in the locality and can be depended upon to do certain work in a certain way. It may be that exploratory work is done under contract, at so much per foot, and in dull times like these the cost is minimized owing to keen competition. If the mine is closed down pending a revival of metal prices, the force at the mine becomes disintegrated, many of the men leave the locality, and in the interval the mine itself suffers, for all experienced men know that idle workings will cave and the timber in abandoned levels will rot to such an extent as to make repairs excessively expensive when finally they become requisite on a general resumption of operations. If the mine is not closed down, but extraction ceases, while development proceeds, the shareholders get no dividends; while if extraction proceeds, while development is stopped, the shareholders get a temporary profit at the expense of destroying the future earning power of their property. But another factor comes into play, namely, the moral obligation to the community. The people of a mining community do not share directly in the prosperity of a mine, save in so far as they get the chance to work, and it is by their work, especially if it be efficient, that the company has prospered. It owes something in return and it will find its interests best conserved by having some regard for this social obligation. A director is in a dilemma nowadays and the situation is not without humor. A feverish metal selling agency pulls one leg and a working miner the other; whose pull is strongest?

A New Alchemy.

A PROFESSIONAL FRIEND sends us a letter from a promoter offering stock in a new process that is to do strange things. Processes that extract more gold than the common fire-assay have often served as a lure to people that want more than they pay for. There was Beam of lamented memory; there was Stephen H. Emmens whom Richard P. Rothwell controverted, and there have been alchemists of a later day—some deluded, others deluding. The higher chemistry has been invoked, the mysteries of radium have been quoted, and names celebrated in science have been used to beguile speculators (they call themselves 'investors') who have read turbid accounts of missing elements and fractional precipitation in non-technical and wholly irresponsible newspapers. The present story is that of a Denver Faust who has discovered a process, shares in which are purchasable with United States currency. The patent "was not issued until the process had been tested at Washington, and the Government officials saw that it would do the work." This statement puts the stamp of imposture on the affair at once, for Uncle Sam is too busy to test processes and there are no Government officials whose business it is to check the process-monger. It is easy to obtain a patent and even the comparative idiocy (from a metallurgical standpoint) of his claim will not bar issuance of exclusive rights to an inventor. According to the letter shown to us, "the discoverer was a colored man, and a practical miner. He was a self-made metallurgist of amateur ability." We expect to find 'the nigger in

the woodpile' and we are ready for statements even more highly colored than the inventor, but we do demur to "amateur ability." "In his investigation he fell onto the solutions of chemicals that would do certain work and his fellow miners sustained him while making his experiments." We trust the promoter will fall into the solution and that it will be "something with boiling oil in it." Although the other miners sustained the inventor (we hope, with pork and beans), they refused to elect him president of the company because it was found "difficult to interest capital while a negro was at the head of the corporation." Thereupon they engaged the gentlemanly financier aforesaid, who wrote the letter "to sell stock on a commission of 65 cents per share." Experiments were made with success until the directors quarreled among themselves. At this juncture "the smelter trust told the mine-owners that they must not sell their ores to the new process company, because it was in violation of contracts." So the bold bad Trust spoiled the hard work of the colored Alchemist and in consequence the patent was sold to the Promoter to satisfy a judgment obtained against the Company. He made "repeated tests" and satisfied himself that he had "the biggest money-making proposition in the West today." Seeing that he could turn \$10 ore into \$20 ore, he undoubtedly did have a "money-making proposition." But did he hug it to himself, buy a cellar, and proceed to make Rockefeller look like a rose of yesterday. No, Sir. He was an altruist; he offered a share in his epoch-making money-making coin-manufacturing enterprise to you and to me, and to all who had the price in their jeans. Then follows an account of the process; it is what the old lady called the "delirious trimmings" of metallurgy. "Ore is crushed to 120 mesh; mesh is placed in a tank; then it is covered with a solution of water, plain salt, ammonia, sulphate of iron, and then agitated. The metals that were already developed by nature fall back into the mesh from the solution. The metals that were in process of formation by nature (but which had not matured naturally until matured by the presence of chemicals among them) come to the surface in a scummy form" and so forth. Evidently the 'mesh' is a weird sort of thing, but not half as bad as getting into the toils of such a faker. He proceeds to state that ore that gave \$29 by fire-assay yielded \$12 after chemical treatment, 3 oz. ore became 11 oz. stuff, 5 oz. ore was transmuted into 17 oz. ore, and so forth. He offers an opportunity to become wealthy suddenly, by the purchase of 25,000 shares for \$2,500. As a bit of salt on the tail of an unwary bird, it is added that "it is altogether probable furthermore that by the time the process is really on the market in a commercial way, there will be a demand for the entire corporation assets from either the American Smelting & Refining or the United States Smelting company." It is a sign of the times when these two companies are mentioned as possible rivals for a process that puts gold into ore instead of taking gold out. We are in the dawn of a new era. The astrology of yesterday is the astronomy of today; chemistry and alchemy are one; spoofery and finance have kissed each other. Selah.

By the Way.

In a recent issue of the *New York Evening Post* we find the following suggestive letter, written by Mr. Henry A. Wise Wood. He says:

In order to gain a correct understanding of the causes which have brought about the existing financial crisis, one must look at the situation from a sufficient distance in point of time to enable him to detect the various steps by which it has approached.

(1) For several years past there has been an ever growing stringency of money at about this season. The facts of the regularity of its occurrence, and the increasing severity of this autumnal money shortage, call for three comments: That the thin ice of finance might invariably be expected to form during crop-moving season; that its attenuity might yearly be expected to increase; and, the foregoing being so, that an autumn at last might be expected to arrive having a financial ice-film too fragile to support financial skaters, should one of them fall.

(2) Several years ago by a writer, Ida Tarbell, for the first time the public was aroused to the immense power which it is possible for the corporation to wield, and, in the case of the nation's greatest corporation, as to how that power had been and still was being used to oppress the people and evade their laws. It may be said that then, as never before, the public as a whole understood the menace of this extraordinary corporate machine which had been devised for the people's exploitation.

(3) Shortly thereafter another writer, Thomas W. Lawson, carried the Tarbell exposure still further, and revealed to a by then thoroughly awakened public the particular machinery by which it was possible for those wielding this supreme corporate power to loot at will other, smaller, corporations, and, generally, whomsoever they chose.

(4) Immediately following upon the foregoing came the insurance exposures, which confirmed the public in its belief that its aroused fears were justified. It having been discovered that so lauded a fiduciary institution as the life insurance company (for the sacredness of which so much had been claimed) could so easily be led to go wrong, a startled people began to ask if their savings could be safe from the hands of the predatory manipulator in the till of any corporation.

(5) Next in order came the Chicago & Alton revelations; when, with another gasp, the people, still more firmly gripping their purses, began to question the safety of their railway investments in particular.

(6) By now the foregoing incidents had begun to tell upon the popular temper; how often and thoroughly the interests of stockholders had been disregarded or deliberately sacrificed for the personal benefits of those in control of their properties had at last been made clear, and the general confidence in corporate management began to totter.

The outburst of active national resentment which followed, and its resulting widespread campaigns of retaliation, are occurrences too recent to require more than passing notice. But these still further increased the anxiety of those holding corporation stocks (particularly stocks of the railroads), and a further shrinkage of values followed. The shareholder, seeing, on the one hand, the spectre of corrupt management stalking among the corporations whose stocks he held, and, on the other, that of an aroused people bent upon scotching the first spectre, and thinking himself to be between the two, very naturally wished to escape.

(7) Into the midst of this state of affairs came the

\$29,000,000 bomb of the law, and burst; when suddenly it was perceived that corporations could be held to account for their sins, *in dollars!*

This seems to have been the first time in American finance that it was borne in upon the popular consciousness that laws which conflict with moneyed interest have a standing in court, and must be obeyed, and that there may be enforced, as penalty for the wrongful acquisition of money, the surrender of money in large enough sums to be painful. The resulting consternation and flight to cover of holders of shares in involved corporations or of corporations under suspicion are perhaps the highest tribute we have ever paid to the efficacy of law for the discouragement of wrongdoing, when it is drastically enforced.

(8) Now came the exposure of the Metropolitan traction looting episode, to pull drum-tight the tension of an already over-wrought community.

(9) The confidence of the people in the integrity of the management of its corporate enterprises had at last been so successfully shaken as to have become substantially destroyed. Among those charged with corporate management the fear of retaliatory action by the people and the courts had grown to panicky proportions. Neither trusted the other, and, with mutual confidence rapidly vanishing, enterprises which had been reared in fatuous disregard of the trend of affairs, upon the presumption that previous values were normal and therefore stable, began to feel their centres of gravity shifting towards the danger point. And this strained situation happened to coincide with our, this year's, now periodic and annually increasing autumnal money stringency.

Such was the critical condition of things financial when the dynamic action of a copper stock speculator suddenly threw a violent strain upon the already unstable structure of credit which the latter was too weak to resist, and it collapsed.

(10) During the first hours of wreckage there was revealed the existence, in unexpected quarters, of sinister banking practices not therefore believed to be possible. So throwing the little confidence left him to the winds, the average depositor, believing his money to be safe only in his own possession, hastily withdrew it from bank.

Recrimination is futile, because it beclouds the philosophy of the situation by preventing a dispassionate examination of such forerunning events as culminated in the present trouble; and, through obscuring the truth by obtruding the consideration of persons, where impersonal causes alone should be sought, it is bound to lead us astray in the devising and application of remedies.

If the present *débauche*, as would seem to be the case, marks the passing of our industrial life from a period of lawlessness into one which can successfully conform to adequate laws of property and conduct and thrive therein, then few should complain of the price which is being paid. But let us not pay the price in vain. Let us take care to secure ourselves, by so adjusting and enforcing our laws that a return to past conditions of lawlessness shall be simply impossible; and by so ordering our industrial activities that they shall seek, and benefit by, instead of suffer from, the rigid application of law.

According to James M. Beck, one of the underlying causes of the present financial convulsion is the dislocation of our Constitutional machinery, due to the superior forces of steam and electricity. They have caused the respective orbits of the States and Federal Government to overlap, with the result that today we are attempting the impossible governmental problem of having, as to commerce, two sovereignties supreme in practically the same orbit.

Personal.

HIRAM W. HIXON is now residing at Philadelphia.

HENRY W. CATLIN has recently been to Oaxaca, Mexico.

FRED. A. GOWING, recently at Cananea, is in San Francisco.

OSCAR B. PERRY has returned to New York from the Yukon.

DONALD F. CAMPBELL will spend Christmas in San Francisco.

HERBERT W. ROSS leaves for Cerro de Pasco, Peru, on December 28.

H. DEC. RICHARDS has returned to Orleans Bar, in Si-siyou county.

PERCY WILLIAMS has returned to Los Angeles from Fairview, Nevada.

SCOTT TURNER is expected in San Francisco next week from Nevada.

J. V. N. DORR has returned to Denver from the Black Hills, South Dakota.

J. H. MACKENZIE came from Goldfield to spend Christmas in San Francisco.

W. N. CUMMINGS is with the Southwestern Mines Syndicate, at Tucson, Arizona.

W. H. WASHBURN, recently in Alaska, is now at Mills-paugh, in Inyo county, California.

J. M. PARKER is surveyor and mine sampler at the Abangarez gold mine in Costa Rica.

G. B. KITTO is assistant to the smelter superintendent of the Tye Copper Co., of Ladysmith, B. C.

W. H. KNOWLES, formerly at Idaho Springs, is general manager for the Pacific Mines Option Co., at Los Angeles.

HENRY LOCKHART, JR., of the Consolidated Metals Co. of Mexico City, is now at New York, with L. Vogelstein & Co.

W. B. FISHER has resigned as assistant to the superintendent of the Federal Mining & Smelting Co., at Wallace, Idaho.

WM. WELLS ELMER is general manager for the Hinds Consolidated Mining Company operations at Santa Barbara, Mexico.

E. A. BEHR, formerly of L. Vogelstein & Co. of New York City, is now with the American Smelting & Refining Co. at 71 Broadway.

M. L. SUMMERS, a gold-dredge operative with the Canadian-Klondike Mining Co., Dawson, Alaska, is at San Jose for the winter.

A. D. MOFFAT has resigned as superintendent of the Cactus mine of the Newhouse Mines & Smelters Co. in Beaver county, Utah.

JOSEPH MACDONALD passed through San Francisco on his way from Guanajuato (Mexico) to his home at Portland, Oregon, where he will spend the Christmas holidays.

FELIX CREMER, formerly with the Guanajuato Amalgamated Gold Mines Co., at La Luz, has accepted a position as ore-buyer with the Cia. Metalurgica y Refinadora del Pacifico.

J. V. RICHARDS is at St. Luke's Hospital, Denver. He was hit on the head by a piece of rock as big as a football, knocked off a ladder, fell 65 ft. vertically, and is not seriously crippled, at least he writes saying that he is coming out of the hospital "as good as new."

L. VOGELSTEIN & Co., of New York, give the following figures concerning the German consumption of foreign copper for the period from January to October, 1907:

Imports of copper.....	103,865 tons
Exports " "	7,470 "
Consumption.....	96,395 tons

as against a consumption during the same period in 1906 of 101,715 tons. Of this quantity 82,351 tons were imported from the United States.

Latest Market Reports.

LOCAL METAL PRICES—Dec. 26.

Antimony.....	12@16c	Quicksilver (flask).....	\$45.5
Castling Copper.....	17½@18½c	Spelter.....	6@ 6.75c
Pig Lead.....	3.85@ 4.80c	Tin.....	33@34½c

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.

Date	Electrolytic Copper	Lead	Spelter	Silver
Dec. 20.....	127½	3.40	4½	53
" 21.....	131½	3.40	4½	52½
" 22.....	Sunday.	No market.		
" 23.....	131½	3.40	4½	52¾
" 24.....	131½	3.45	4½	52¾
" 25.....	Holiday.	No market.		
" 26.....	131½	3.50	4½	52¾

ANGLO-AMERICAN SHARES.

Cabled from London.

	Dec. 19.	Dec. 26.
	£. s. d.	£. s. d.
Camp Bird.....	0 13 6	0 13 9
El Oro.....	1 1 3	1 1 3
Esperanza.....	1 10 0	1 8 9
Dolores.....	1 0 0	1 0 0
Oroville Dredging.....	0 14 0	0 13 9
Stratton's Independence.....	0 3 3	0 3 3
Tomboy.....	1 10 0	1 10 0

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

MINING STOCK QUOTATIONS—NEW YORK.

Closing Prices.

	Dec. 18.	Dec. 26.
Alaska Mexican.....	.....	5½
Alaska Treadwell.....	.....	27½
Bingham Central.....	¾	¾
Boston Copper.....	10	9½
Cumberland Ely.....	5½	5½
Dolores.....	5	.....
El Rayo.....	1½	1¾
Guanajuato Con.....	2	2¼
Giroux Con.....	2½	2¼
Nevada Con.....	7¾	.....
Nipissing.....	6½	7½
Tennessee Copper.....	28	19½
Tonopah Ex.....	0.89	1.25
Tonopah-Belmont.....	0.75	.....
Tonopah.....	5	5.37
United Copper.....	7¼	7
Utah Copper.....	17½	17½

(By courtesy of Hayden, Stone & Co., 25 Broad St., New York.)

SOUTHERN NEVADA STOCKS.

San Francisco, Dec. 26.

Atlanta.....	\$ 30	Laguna.....	85
Belmont.....	87	Manhattan Con.....	24
Columbia Mtn.....	18	Midway.....	55
Combination Fraction.....	75	Mizpah Extension.....	5
Daisy.....	90	Mohawk.....	12.00
Fairview Eagle.....	35	Montana Tonopah.....	2.00
Florence.....	3.80	Nevada Hills.....	3.00
Gold Bar (Bullfrog).....	38	Red Top.....	.....
Goldfield Con.....	4.60	Sandstorm.....	21
Goldfield of Nevada.....	1.05	Silver Pick.....	27
Gold Kewanas.....	24	St. Ives.....	44
Great Bend.....	29	Tonopah Extension.....	1.25
Jim Butler.....	41	Tonopah of Nevada.....	5.37½
Jumbo.....	.....	Tramp Con.....	18
Jumbo Extension.....	58	West End.....	33

(By courtesy of W. C. Ralston, 368 Bush St.)

COPPER SHARES—BOSTON.

Closing prices.

Dec. 21.

Closing prices.

Dec. 24.

Adventure.....	.....	Michigan.....	8¼
Ahmeek.....	24	Mohawk.....	44½
Allouez.....	25	Nevada Con.....	7½
Amalgamated.....	45	North Butte.....	40¼
Arcadian.....	.....	Old Dominion.....	27
Atlantic.....	8	Osceola.....	80
Balaklala.....	1¾	Parrot.....	9
Bingham Con.....	4¼	Phoenix.....	.....
Boston Con.....	10	Quincy.....	77
Butte Coalition.....	15	Raven.....	.....
Calumet & Arizona.....	95	Rhode Island.....	2¼
Calumet & Hecla.....	599	Santa Fe.....	1¾
Centennial.....	23½	Shannon.....	99½
Con. Mercur.....	25	Superior & Pittsburg.....	.....
Copper Range.....	55	Tamarack.....	65
Daly-West.....	.....	Trinity.....	16¼
Franklin.....	7¼	United Copper com.....	7¼
Granby.....	72	Utah Copper.....	17¼
Greene-Cananea, ctf.....	5½	Victoria.....	4¾
Isle Royale.....	17¼	Winona.....	4
Mass.....	2½	Wolverine.....	112

General Mining News.

ALASKA.

The Nome Mining Co. of Nome intends to begin about the middle of next June to operate a dredge of a capacity of 5000 cu. yd. per day; it was designed by E. S. Smith and the buckets, etc., were supplied by the Taylor Iron & Steel Co. It is the largest dredge in that section of Alaska and the company does not anticipate any serious difficulty because of frozen ground.—It is reported that there has been a scarcity of medium-skilled labor in Nome and vicinity during the past season; this may in part account for the fact that the output from this section during 1907 will probably be \$1,250,000 less than during 1906. A very large increase is anticipated for next year.

ARIZONA.

COCHISE COUNTY.

At the Calumet & Arizona mines the plan has been to carry on important development work instead of producing a large quantity of ore. New orebodies first exposed a few weeks ago on the 950 and 1050-ft. levels have been found to be very large. Since the beginning of the depression in the copper market, the company has opened up practically new ground with most favorable results; this is true both at the Irish Mag and Oliver mines. When the price of the metal improves it is expected that shipments to the smelters from both shafts will far exceed those of former times.—The smelter output for November of the Copper Queen company showed a decrease owing to the plan of development work pursued and to the preparation for a new system of taking the ore from the stopes to the railroad. Good progress has been made in sinking the Sacramento shaft; the upper levels are being driven to connect with those being run from the Gardiner, Lowell, and Holbrook. A contract has been awarded for new electric pumps which will be of smaller capacity than the variety now in use. The construction of the new power house is progressing rapidly.—On the lower levels of the Superior & Pittsburg mine orebodies of large dimensions are being developed. All of the November working force has been retained; shipments to the smelters held up pretty well and were principally from the Hoatson, Cole, and Junction shafts.—At the Denn-Arizona mine, the boring of a diamond-drill hole from the 1100-ft. level was begun.—The mill at the Le Vanita mine has been running on ore carrying lead and gold. The lowest workings of the mine are down 225 ft. in a fissure vein in granite and the best ore is found at that depth.

GILA COUNTY.

The new electric hoist in the 200-ft. winze of the Old Dominion mine has been installed between the 14th and 16th levels and it is expected that the work of developing the latter level will progress rapidly.—The Payson Gold M. & M. Co. has shipped machinery from Mesa via Roosevelt for the erection of a mill at its mine.—The Saddle Mountain Mining Co. has filed a mortgage for a large sum on its property at Christmas; it includes the mine and smelting plant. It was made for the purpose of discharging the company's indebtedness and to create an operating fund to be used when the copper market shall have returned to normal conditions.

GRAHAM COUNTY.

The Gold Belt Development & Reduction Co. shipped two cars of high-grade copper ore from its mine at Morenci to the Shannon smelter for treatment. The same company has begun shipping from its gold claims and has nearly a carload in the railroad yard. The ore carries well in gold besides considerable value in other metals. This is the first gold shipment made by this company and the result will be watched with much interest.—The Shannon Copper Co. at Clifton is having a concentration test of its ore made at Concentrator No. 6 of the Arizona Copper Co. at Morenci.—Bids have been called for by the Home Copper Co. for the drilling of a 1000-ft., a 2000-ft., and two 500-ft. holes on its property. The bids are to be made in two forms; fur-

nishing the drill and full equipment, and on the work alone with everything furnished.

The Bacon & Langerman silver mine, east of Morenci, is under development and occasional shipments of ore are being made to the smelters.—At the Chase Creek mine, driving an adit to develop a large body of low-grade ore continues.—Louis Ferber and associates are making occasional carload shipments of gold-silver ore from the Morenci district to the Douglas smelters.—At the Standard copper mine, the force on development work has been curtailed, but regular shipments of ore are being made to the D. C. smelter at Morenci.

MOHAVE COUNTY.

The Victor Gold Mining Co. is building a large mill and cyanide plant at its mine near Vivian.—Sinking is in progress in the P X mine in I X L basin; large bodies of lead-silver ore had been opened to water-level, but the ore recently found in the shaft is of better grade.—The mill at Stockton Hill is turning out a large amount of heavy lead concentrate.—Work will be stopped in the Pyramid mine on account of the installation of heavier machinery; this will be operated electrically.

PINAL COUNTY.

A mining excitement has been caused in the neighborhood of Mammoth by the discovery there of gold-bearing ore.—E. R. Stafford has shipped a carload of high-grade copper ore to the El Paso smelter.—W. McGrew and J. Schwartz have recently sunk a shaft on their claims at the head of Cottonwood canyon; on reaching the water-level it cut a vein carrying chalcopryite and bornite, besides some gold and silver.—Work has been suspended at the Copperosity mine until the financial situation throughout the country becomes more nearly normal.

SANTA CRUZ COUNTY.

At the Llano copper mine, near Llano station, work is progressing satisfactorily, and good orebodies are being developed.—Stephen O'Connor is developing the Joe Wheeler, Winnebago, Chief, and Ivanhoe claims near Duquesne; he has sunk 60 ft. in ore.

YAVAPAI COUNTY.

At the Fitzhugh Lee mine 25 men are employed. They are driving an adit to reach a rich ore-shoot which is exposed in a higher tunnel; they are also sinking a winze on the ore. A hoist is to be installed in the upper tunnel. The mill has been thoroughly overhauled and is ready to begin crushing several hundred tons of ore from the Bordeaux mine, which is owned by the Money Metals Mining Co. G. P. Henderson is superintendent of the Fitzhugh Lee mine.—The Silver Chord mine in the Black Canyon district has been bonded to C. W. Ruffner. A 50-ft. adit, it is said, exposes 46 in. of ore carrying \$60 per ton.—The Octave Mining Co. intends to add 40 stamps to its mill at the Octave mine; also to install a 1000-hp. electrical plant near Wickenburg on the Hassayampa river. The transmission of some of this power 14 miles to the mine will dispense with the hauling of oil. Power will also be furnished to a number of other mines in the same section; the purchase of 600 hp. has already been guaranteed. The electrical plant will cost over \$150,000 and the addition to the mill at least \$65,000. At the Octave mine 178 men are working. Some of the shafts are down about 2000 ft., the newest one, the Joker, is now 500 ft. deep. There is said to be blocked out over 180,000 tons of ore; it carries an average of \$9 gold per ton. The mill crushes 140 tons per day; a recent clean-up yielded a \$20,000 bar of gold.—The Monte Cristo mine has been bonded to the Yavapai Silver Mines Co. Jennings Bros. have been operating the property under a lease during the past year. They have made several carload shipments of high-grade silver ore; the net proceeds from this ore, which was taken out in development, has paid all operating expenses. There is a large amount of ore in sight at the mine and on the dump; some of this carries 100 oz. silver per ton. Preparations are being made to develop on a more extensive scale.—At the Bordeaux mine in the Big Bug district, the drift on the 100-ft. level has followed the ore-shoot for a distance of 150 ft., the ore

varies between one and three feet in thickness. Some of the ore from the drift is being treated in the Arizona M. & M. Co.'s mill near Poland. It is expected to yield \$10,000 worth of concentrate besides the gold caught on the plates.

The new mill of the Mt. Tritle Copper Co. in the Slate Creek district, has been completed; it is of the Nissen pattern, 30 tons daily capacity. Ore-shoots recently found in the upper and lower adits of the Mt. Tritle mine are proving better with every foot gained in these openings. The property is equipped with an air-compressor, power drills, and electric-light plant.

YUMA COUNTY.

The second payment has been made by David H. Hyman on the North Star group of mines in the Kofa district; this property is better known as the 'Mayhew strike.' A 50-hp. air-compressor has been ordered, and it is intended to erect a 20-stamp mill.—At the Ibex-Plomosa mine, work will be resumed after the holidays. As the first shaft caved at a depth of 60 ft., a new shaft will be sunk.—The Little Dutchman, Reid, and Old Maid prospects in the Bouse district have been bonded to a Michigan company.

CALIFORNIA.

CALAVERAS COUNTY.

The trouble between the operators and employees of the mines at Angels Camp, reported last week, has been adjusted; the management of the mines conceded to the men the 15 min. claimed by them as their right.—It is reported that the Utica company will engage a large force of men in the near future.—At the Melones mine about 75 men are employed; the mill is dropping 100 stamps. A new flume has been built much higher up on the hillside than the one destroyed by a flood last spring.

ELDORADO COUNTY.

The lessees of the Blue Rock mine, in the Georgetown district, have found a gold nugget worth \$318.—It is said that the owners of the Mt. Pleasant mine are preparing to substitute electricity for the present motive power; this is to be generated at the Cosumnes river.—Nic. Ferretta and Ed. Christian are preparing to re-open the Sunnyside mine near Newtown.

INYO COUNTY.

The mines of the Ballarat district are quite active. The machinery for two new reduction plants is on the ground; one is for the Snow Canyon Mining Co. and another for a property at the south side of the district.—D. D. Johnson has secured a bond on the Neylon group of mines in the White Mountain range.—At the Dunlap mine an ore-body has been found at the end of an adit 600 ft. long.—At the Red Rose mine ore of great richness is reported.—Development continues at the Black Canyon mine.—At the Gray Butte mine the adit has been driven 100 ft. and in its face has ore 6 in. wide; this is said to assay \$80 gold per ton.—The recently built Keane Wonder mill, on the edge of Death Valley, has made its first shipment of bullion, amounting to \$16,000, the result of 12 days' run.

An adit is being driven at the Black Canyon mine to develop at depth a large lode of milling ore recently discovered near the surface.—At the True Fissure mine the main vein has been cut in the adit at a depth of 200 ft.; it is 13 ft. wide and is said to assay about \$12 per ton.—A large amount of development work has been done during the past summer at the Bishop Creek mine; in the upper workings a large tonnage of fair-grade ore has been exposed.—At the Killian mine the adit is in 300 ft.; several well defined veins carrying fair values have been found.—High-grade silver-lead ore has been opened a short distance below the surface at the Bishop-Ellis mine in Marble canyon.—The Buckeye M. & S. Co. has begun sinking a double-compartment shaft at its mine on Poverty hill; it will be 500 ft. deep.

MONO COUNTY.

At the Golden Gate mine 14 men are working. The tunnel is in 175 ft., and will be continued 700 ft. farther to the old workings. It is intended to erect next spring a 10-stamp mill beyond the snowslide zone.

NEVADA COUNTY.

The Iron Mountain copper mine has been closed for the winter.—A 10-stamp mill will be erected by the Canada Hill Consolidated Co. A. Charonnat is superintendent of the mine.—Good ore has been found in the Blue Rock mine; it is on the west rim of the old Badger Hill hydraulic gravel mine.—Work is progressing in the development of the ore-shoot recently found on the 900-ft. level of the Banner mine.—At the Boss mine development continues with encouraging results.—A number of miners who have been working 'tribute pitch' at the New York-Grass Valley mine have made a nice clean-up after operations extending over several weeks.

PLACER COUNTY.

Work has begun at the Boulder mine, at Ophir; C. Cooper is in charge.—A 2-stamp mill has been completed at the Rueblin mine.—At the Grey Eagle mine the work being done is confined to cleaning and retimbering the adit.—C. W. Kellogg is erecting a hoisting plant at the Klondike mine.—At the Hidden Treasure mine the gravel in the 'blue lead' is prospecting well. The ground has been blocked out and gangways opened so as to afford room for a large force of men to work.—The buildings have been completed and most of the machinery placed in position at the Herman mine.—Twenty men are employed at the McGeachen mine; Elmer Rose is superintendent.

PLUMAS COUNTY.

A force of engineers under H. S. Turner, representing the Forest Service, is making an examination of alleged mining lands to determine whether they are properly classed as such.—At Pilot Peak an adit is being driven by Plume Turner and brother to develop at depth a lode from the outcrop of which they secured some rich ore some time ago.—The old drift mines at Saw Pit are being reopened by George Sanborn.

SAN BERNARDINO COUNTY.

A discovery of mica of commercial quality is reported to have been made by J. D. Ball near Ivanpah. It is stated that the vein can be traced on the surface 500 ft.; the owner displayed a sample 12 in. wide, 14 in. long, and 1 in. thick; from this he split off, without cracking, a plate one-sixty-fourth of an inch thick.

SHASTA COUNTY.

The Sacramento Valley & Eastern R. R. has been finished to Heroult. The electric iron smelter at Heroult has been closed for a few days, pending the installation of new machinery. A 250-kw. transformer arrived at Redding for this purpose. Prof. Dorsey F. Lyon, of Stanford University, has been granted a six months' leave of absence for the purpose of completing certain experiments in designing a new furnace for the Heroult smelter.—The bond on the Golin-sky mine, which is held by the American Smelters Securities Co., has been extended for a period of one year. The work being done in the mine is said to be resulting encouragingly. The bonding parties will continue shipments to the Selby smelter.—The Clear Creek dredge, which is being constructed by the Consolidated Gold Dredging Co., is nearly ready to launch. It is 84 ft. long and 35 ft. wide. It will draw two feet of water.—The Garrecht mine, near Shasta, has been sold; it has been under development for two months.

The Afterthought mine was closed on Dec. 14. The smelter at Ingot will continue in operation until the ore on hand is treated.

SIERRA COUNTY.

The Sierra Buttes mine is not working its full crew on account of not being able to get enough timbers for the winter.—The Cleveland mine has resumed operations after an idleness of many years.—At the Keystone mine the mill which was destroyed by a snowslide has been replaced by a new one and other repairs are about completed.

SISKIYOU COUNTY.

Supplies have been packed to the Yellow Rose mine, preparatory to resuming work. This mine is nearly 7000 ft. above sea-level.—A long and bitter litigation over the Garvey Bar hydraulic property, on the Klamath river, 12

miles below Hornbrook, has been ended. The bar contains 80 acres of gravel of proved value; it was sold several years ago to the Klamath River Gold Mining Co. This company prospected the property; on Aug. 31, 1904, the ancient channel was found. An injunction stopped work, but later one of the original owners was placed in charge; in six weeks, working only two men, he took out \$22,000.—At the Champion mine, on Humbug creek, a contract is to be let for a 1000-ft. tunnel; air-drills and an electric lighting plant will be installed.

STANISLAUS COUNTY.

A Colorado dredging syndicate has been bonding lands along the Tuolumne river between La Grange and Modesto. It is said that samples of gravel taken from the river channel carry good value in gold.

TRINITY COUNTY.

At the Golden Jubilee mine, near Coffee creek, a new 20-stamp mill is being installed. The cyanide process is applied in treating the tailings. A drift has been extended along the vein a distance of 400 ft. on the 200-ft. level; this has developed a number of lenses of ore.—All the machinery has been removed from the old dredge that has been marooned above Trinity Center for more than a year. The owner, an Illinois corporation, is building a dredge near Callahan.—It is expected to resume operations within a short time at the Quimby mine near New river; provisions have been packed in and a force of men will be secured as soon as possible.

Forty-four miners have attached the Bonanza King mine for \$6000 due them as wages. The attachment is an outgrowth of the failure of the California Safe Deposit & Trust Co., in which the owners of the Bonanza King were largely interested as stockholders, and from which was borrowed the money to develop the mine.

TUOLUMNE COUNTY.

Workmen are grading for a 10-stamp mill at the Ilon mine.—A trustee's deed of sale of the old John Royal mine, near Columbia, has been given to Albert and Charles E. Smith.—At the Omega mine sinking has been resumed in the main shaft at a depth of 350 ft.; it will be sunk 100 ft. deeper.—The Eagle Shawmut mine was to resume operations on Dec. 19 after being closed six weeks in order to give everything about the mine and mill a general overhauling.—Eighteen men are sinking the shaft at the Joy Mining Co.'s property at Jacksonville.—At the Harvard mine the mill was started on December 17, after having been idle for two weeks for want of electric power.

Good progress is being made in rehabilitating the old Brandy City hydraulic mine, above Camptonville. More than 50 men have been employed for several months in building about six miles of road from Indian valley to Brandy City, in constructing a bridge across the North Yuba river, and in rebuilding the Hoosier flume. A saw-mill is being erected on Little Canyon creek. The company will build restraining dams in accordance with plans already approved by the U. S. Debris Commission. Frank Strandburg is general foreman for the company.

COLORADO.

CLEAR CREEK COUNTY.

At the Specie Payment mine the new electric plant has been started and shipments of ore to the Newton mill were resumed on Dec. 12.—At the Shafter mine all work is being carried on through the Big Five adit since a connection was made with the Shafter shaft; the shipment of ore of smelting-grade has begun.—A trial shipment of ore from the 700-ft. level of the Lamartine mine returned \$50 per ton.—At the Quito mine there was found a streak of ore so rich in gold in a free state that panning was adopted and the gold sold at the mint.

LAKE COUNTY.

Operations have been resumed at the Walden mine, which has been idle for many years. It contains a body of first-class iron ore which is being mined and sent to the smelter.—The Emerald Mining Co. in driving an adit at its mine at Chalk ranch, is nearing the point where it expects to cut the main vein.—The Breece Hill district continues

to be extremely active, and the properties being worked are shipping a good grade of silicious, sulphide, and iron ores; a large number of men are employed. The usual tonnage is going out from the Little Johny, Fanny Rawlins, Big Four, Penn, M. N., Gold Basin, and Highland Chief mines.—A stamp-mill has been erected on the Miller group of claims in Lackawana gulch.—The Arkansas Valley smelter is operating practically all of its furnaces and consignments of ore have shown little decrease.

IDAHO.

BLAINE COUNTY.

The Five Points group of mines, a few miles north of Soldier, has been bonded to Mrs. E. C. Atwood. The property has two well-defined veins that carry gold, silver, and lead. Several thousand tons of ore are exposed in the workings down to a depth of 700 ft.—Operations were resumed on Dec. 18, with a full force of men and teams, upon the dam and ditch being made to supply water to the electric plant to be installed by the Idaho Mines Consolidated Co.—Work is soon to be resumed on the claims of the Rosetta Mining Co., in the Little Smoky district.

IDAHO COUNTY.

At the Anaconda mine, in Newsome district, work is to be resumed in a short time; it is expected that 10 to 15 men will be employed during the winter.—The Oregon Mining Co. has a large crew of men working on its Summit Flat property.—John and Earl Hokenson recently found a 5-ft. lode of ore in the Sunshine mine at Orogrande.—The Frisco Mining Co. has begun driving a new adit on its property; it will be nearly 700 ft. long. George C. Glatz is superintendent.

NEVADA.

CHURCHILL COUNTY.

The Piroutte Gold Mining Co. intends to install a 25-hp. hoist at its mine at Wonder. The shaft is now 103 ft. deep. It was started on an 18-in. vein; from ore at the depth of 85 ft. assays as high as \$167 per ton were secured.

ESMERALDA COUNTY.

On Dec. 20, Governor Sparks received a message from President Roosevelt advising him that the troops would be withdrawn from Goldfield on Dec. 30. The President's reasons for the withdrawal of troops are that there does not appear to be a state of insurrection in Goldfield, and in the absence of such condition, the United States troops would only be doing police duty while on the ground. The State Government has failed to perform its full duty and Governor Sparks seems disinclined to convene the Legislature to consider the formation of a State military force. The Goldfield Mine Operators' Association has announced that the presence or absence of the troops will not affect its position. It will employ guards and discharge, as far as possible, the duties that it feels really belong to the State and Nation. O. N. Hilton, attorney for the Western Federation of Miners, on Dec. 19 addressed a letter to the mine owners requesting a conference where the differences might be at least temporarily adjusted; but the Goldfield Mine Operators' Association replied that it would be useless to meet Mr. Hilton, as attorney for the Western Federation of Miners, as any attempt at compromise or new agreement with that body could not lead to permanent peace. Independent workers for the operation of the Goldfield mines have been arriving from outside points all week. They have been met at the depot by representatives of the mine operators and taken at once to the quarters provided at Jumbotown, in the heart of the mining district; here they were housed and fed. These men have been selected with great care, because they are expected to become permanent employees. They will be put to work principally in the Mohawk mine; the experienced shaft-men will sink the main shaft below the 450-ft. level. It is intended that by the time the troops are withdrawn, the whole district will be supplied with miners from outside points.—The Elks Consolidated lease on the Yellow Tiger claim has been worked during the strike in the Goldfield district. A three-compartment shaft has been sunk to a depth of 530 ft. At the 500-ft. point it penetrated a large vein which is reported to carry a value of \$14 per

ton.—Charles Rookard was arrested on Dec. 17 on complaint of the Little Florence management; $6\frac{1}{2}$ tons of ore valued at \$4000 were found in his possession.

HUMBOLDT COUNTY.

The recent rich strikes in Wild Rose canyon in the Seven Troughs district have greatly stimulated development work in that section. In Wild Horse canyon the returns in the pan are as good as in any other canyon in the district.—The Seven Troughs Kindergarten Co. expects to begin the construction of a 10-stamp mill about Jan. 1. It will handle custom work and will be of great benefit to lessees who have developed ore of milling value. Tests will soon be made upon the ores of the district to ascertain the cost of treatment; it is estimated that it will average \$5 or \$6 per ton. It is said that many properties in the district have large bodies of ore carrying \$8 to \$35 gold per ton.—At the Eclipse mine a lode 25 ft. wide has been cut at a distance of 125 ft. in the adit; it is said to carry \$5 to \$25 gold per ton.—At the Sunlight mine at Spring Valley a large amount of ore is being mined and shipped to the smelters.—At the Bonanza King mine only the second-grade ore is being milled, but regular shipments of bullion are being made.

LANDER COUNTY.

The Nevada Equity Mines Co. discontinued work on account of the non-arrival of necessary timbers.—At the Dudley B. mine the north drift has reached good ore three feet wide.—The lessees at the Jack Pot mine are sacking high-grade ore.—Ore shipments, it is expected, will soon be resumed at the Watt mine.—The shaft at the Wholey mine will be cleaned out and more miners will be put to work.—At the Austin mine, Leutjues & Quigley have been driving an adit on a vein averaging 8 in. wide.

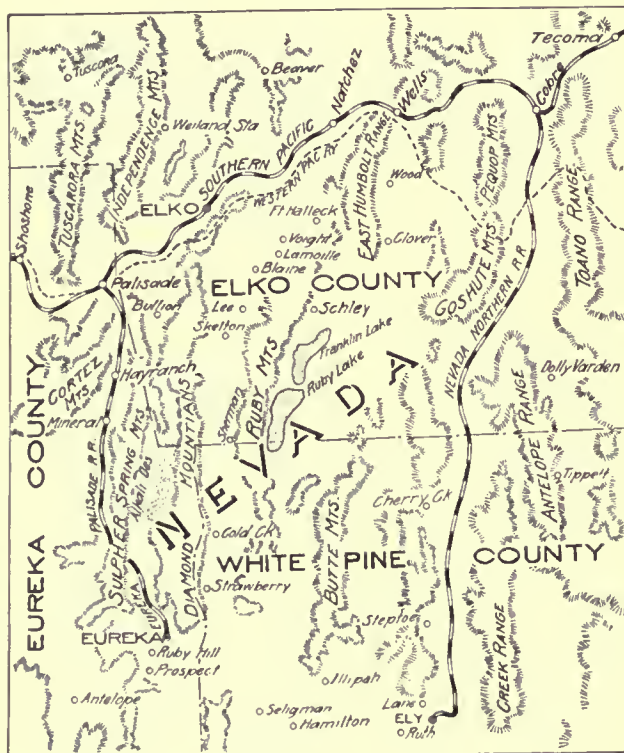
LINCOLN COUNTY.

Work is in progress on the 100, 150, and 300-ft. levels of the Duplex mine at Searchlight. A new orebody has been found in the main shaft at a depth of 300 ft.—At the Parallel mine ore is being sacked to make up the first carload for shipment; it is supposed to carry \$70 gold per ton.—The owners of the Silver Legion mine intend to erect a reduction plant, but have not yet decided upon the type.—A body of ore 10-ft. wide has been cut in the Mizpah mine; it is supposed to carry an average value of \$35 gold per ton.—Free gold has been found at the bottom of a 30-ft. shaft on the Bonanza group of claims at Searchlight.—The Aftermath claim of the Empire group at Nob Hill has been leased for two years to Alexander Rannie. There is on the claim a 45-ft. shaft which exposes a lode three to five feet wide; this is said to carry \$37.50 per ton.—At the Wyoming-Searchlight mine a new orebody has been found at the 200-ft. level. It is described as a vein over two feet wide of solid quartz which will average \$25 per ton.—Work is progressing on the tunnel which is to be driven through the hill at the Epistretre mine at Eldorado Canyon.—At the Red Light mine a vein two feet wide of apparently good ore was found at the bottom of a shaft 30 ft. deep.—It is intended to begin development work at the Boulder mine about Jan. 10.—The owners of the Philadelphia-Searchlight mine are planning the erection of a mill.

NYE COUNTY.

(Special Correspondence).—At present there are about 75 men working in Manhattan, including those employed at the mines and mills, and those doing assessment work. In spite of the efforts of the local and Tonopah papers to boom the camp, it is in rather a bad way, and this winter will be a hard one here, as in many other Nevada camps. It was thought that the starting of the 10-stamp mill of the Manhattan Ore Reduction & Refining Co. would stimulate speculative interest in the camp, but the mill has run but little as yet, and is still hardly ready for operation. Three days after the stamps first started dropping, the masonry foundation under the motors gave way, a concrete retaining wall had to be built around it, and the drop of the stamps lowered from 6 to 4 in. The cyaniding department is not yet finished, and the slime is being stored in the storage tanks. Lack of any money with which to pay the men is

handicapping the completion of this plant, and at present the mill-engine is broken down, necessitating a shut-down.—The 10-stamp mill of the Nevada Ore Purchasing Co. has just started, running on lease-ore from the Union No. 9 claim. This plant differs from the other mill in that it has no tube-mill, and will treat sand and slime separately, the latter by agitation and decantation. In addition to these two mills, a small plant is being erected, in which a Huntington mill will be used for crushing.—The Manhattan Consolidated company has hauled about 40 tons of ore per day for six weeks, to the custom-mill, where it is being stocked, but the production has now been cut to 20 tons, and no ore is being hauled. This is about the only property in camp that is breaking ore at present. This ore is mined through two stope-raises that are being run from the 100-ft. level to the surface. The ore occurs in an irregular chimney between limestone and schist, and its lateral limits are pretty sharply defined. This ore has been cut at one point on the 200-ft. level, but there it is lower in grade. A good



Map of Eastern Nevada.

deal of stibnite is found with the ore, and this may cause trouble at the mill. Robert Thomas, formerly at Grand Encampment, is the superintendent.—The Thanksgiving company continues to report daily strikes. One small machine is working on the 236-ft. level, driving on the vein, which is there about a foot wide, lying between limestone and schist, and near a porphyry intrusion. It is understood that some milling ore has been found. W. H. Mott, a lumberman from Michigan, is the superintendent.—Two men are working in ore at the Wolfstone mine.—Exploration work at the Granny mine is being carried on at the 50, 100, 200, and 300-ft. levels. Three beds of limestone have been cut by the vertical shaft, and some ore has been developed in two incline shafts.—The Briggs & Evans lease-dump on the Union No. 9 will be trammed to the mill of the Nevada Ore Purchasing Co. C. R. Evans estimates that the dump contains 3400 tons of ore, that will average \$26 per ton. This was the richest lease ever operated in Manhattan.—Lessees are operating on the Buckboard, Tip Top, and Union No. 4 claims. On the latter ground, two gasoline hoists have been erected, and some ore has been opened in pockets in the limestone. All the banks but one remain closed, and money is scarce; payments to the men being made in stock, by several of the leading companies. The local electric lighting plant, which was operated at a loss for a long time, has been permanently closed down.—The placer lease on the Little Gray claim that

was operated by Cole & Burns, has been closed down for the winter. Some good dirt has been put through the sluice-boxes, and all the clean-ups have been satisfactory.—There are over 250 incorporated companies in Manhattan, and out of this number perhaps a dozen are working, with small forces.—The Pioneer Leasing Co. has pulled its pump and closed down. A little ore was encountered, but not enough to warrant further work; the company still owes its men for two months work.

Manhattan, Dec. 18.

The ore shipments from the Tonopah mines for the week ending Dec. 18 amounted to 5002 tons. The Tonopah Mining Co. sent to Miller 1952 tons, to the Western Ore Purchasing Co. 535 tons, and to Virginia City 699 tons; the Belmont mine sent 1418 tons to Miller; the Extension mine sent 169 tons to Garfield, Utah; the Midway sent 195 tons to Charles Butters at Virginia City; and the Montana-Tonopah sent 34 tons to Vallejo Junction.

NEW MEXICO.

The Anderson-Apache company's mines near Hachita will be worked by contract. William J. Williams of Silver City has been given the contract.—The Copper Gulf Development Co. is endeavoring to increase its holdings in the Burro Mountain district to about 1000 acres. It is said to have 100,000 tons of ore developed by the 200-ft. level of the Virginia mine. This ore is a sulphide which carries between 2 and 4% copper. Other mines in the district are characterized by a barren zone which varies in depth from 100 to 200 ft., beneath this are large bodies of low-grade copper sulphide ore.

WASHINGTON.

SNOHOMISH COUNTY.

Eighteen sacks of rich ore were brought to Tacoma by Robert Fife and a miner. They were offered for sale at the Tacoma smelter, but refused because the ore resembled that found at Goldfield, Nev. This ore, as indicated by a test at the smelter, may contain \$8 gold per pound. It now appears that it came from a vein discovered in October near Bear Gap in the Cascade mountains; the vein is said to be four or five inches wide.—The Bonanza Queen mine at Silverton is again in operation.—A new stamp-mill has been erected at the Hidden Treasure mine near Twisp.—A rich silver vein, it is reported, has been discovered on Martins creek in the Silverton district; some development work has been done on it this season.—A clean-up of the cyanide plant at the Bonita mine is said to have yielded 45 lb. of gold.—The Hellan Mining Syndicate is completing its mill in the Swauk district.—The Gallaher M. & M. Co. is shipping concentrate to the Tacoma smelter; this company's equipment consists of a stamp-mill and a Card concentrator.—The Washington quicksilver mine in the Cle Elum district will be operated all winter; retorts for refining the product have been reconstructed.—Two carloads of concentrate were shipped recently from the Wayside mine at Granite Falls. After the arrival of a new air-compressor it is expected to ship two or three carloads per week. Forty men are employed in the mine and ten in the mill. The mining is done on five levels reached through a shaft 500 ft. deep. The ore concentrates about one to ten, and the value of the concentrate varies from \$60 to \$80 per ton.

CANADA.

BRITISH COLUMBIA.

It is understood to be the intention of the Yale Mining Co., which operates the Nickel Plate mine at Hedley, to return to the scale of wages which was in force some months ago; this scale is about 50c. per day less than the present wage scale. The company has given the men 30 days' notice of the reduction.—Supplies sufficient for the winter have been taken to the Independence mine in the Bear creek district. Five men will be employed. This mine produces a low-grade copper ore.—A carload of ore has been sacked at the Carney mine but will not be shipped until the market is more favorable.—At the Snowshoe mine eight men are employed.—No work is being done at the Mother Lode mine except the installation of some machinery.—Slater & Johns, who have a bond on the

Riverside mine, have made a 20-ton shipment to the Trall smelter.—The work of building a steel flue dust-chamber at the Granby smelter, and of extensive additions to the coke and ore-bins is going steadily along under contract. There is now a more confident feeling that the management of the Granby company and the unions will agree on a wage scale and that both mine and smelter will be in operation in a short time.—At the Aurora mine satisfactory progress is being made in opening up a good body of ore.—While sinking a shaft at the Maggie mine near Cody, a new lode containing 24 in. of clean galena was uncovered.—The Canadian Concentrating & Smelting Co. has closed a contract to ship 1000 tons of ore monthly to a concentrating plant at Toronto.

The output of the Rossland mines for the week ending Dec. 14 was as follows: Centre Star, 4235 tons; Le Roi, 2555; Le Roi No. 2, 630; total, 7420 tons.—The ore received at the Trail smelter for the week ending Dec. 14 was from the following mines: Centre Star, 4347 tons; Evening Star, 30; St. Eugene, 574; Josie, 669; Standard, 23; North Star, 96; Rambler-Cariboo, 63; Ruth, 66; Whitewater Deep, 23; Elkhorn, 16; La Plata, 24; Vancouver, 21; Duncan, 19; total, 5971 tons. There has just been completed a shipment



Map of Part of British Columbia.

of 250,000 oz. of silver from the Trail smelter to the new Canadian mint.

Arrangements have been made at the Nelson custom-house for the shipment of 900 tons of zinc ore from the Vancouver mine in the Slocan district, to Antwerp.—At the Monarch mine at Field, a new body of rich silver-lead ore has been found in driving a cross-cut from the end of the main adit.

YUKON.

The Yukon Gold Co. employs the largest winter force ever known in the Klondike under one management. One large dredge is completed at Ninety Below on Bonanza creek. Three others are building on Bonanza creek and others on Hunker creek; they will be operated by electricity. Three large electric conveyors are being installed on Bonanza creek. A hundred teams are hauling 3,000 tons of pipe-line material from Twelve Mile Landing, on the Yukon river. A great dam is being built on Bonanza creek to supply water for electric lifts and conveyors; and a power ditch at Twelve Mile will generate electricity to operate the dredges and other equipment.

Much development work has been done during the past season on the property of the Arctic Cliff Copper Mining Co. in the White Horse district; it is said that there are now blocked out 100,000 tons of ore that carries about 5 or 6% copper and \$4 or \$5 in gold and silver per ton.

Special Correspondence.

Johannesburg, Transvaal.

Working Costs.—Loss of Chinese.—Reduction of Working Hours.—Planting Trees for Ties.—October Results.—High Stamp Duty.

Most frantic efforts are being made on the Rand to reduce working costs on the mines. During the last six months there has been distinct decrease in working costs. Almost every mine shows a reduction. The principal saving is in white wages, for since the strike the white men have done more work for less pay. The working costs on the Robinson mine six months or so ago were well over 20s. per ton. Last month they worked for 14s. 9d. per ton, and as this mine has every facility for cheap working, such as wide lodes, large stamping capacity, etc., the figure should be maintained without much trouble.

The vital question is: "Can these reduced working costs be generally maintained?" Every effort is being made to keep down expenses. Wholesale retrenchment both at the head office and on the mine is the order of the day. In many cases one man is doing the work formerly done by two. As far as white labor is concerned, the reduction in costs will be maintained. But with colored labor it is quite different. Much of the reduction of costs is due to the high efficiency attained by the Chinese. Had they been allowed to remain for three years longer, even greater improvements would have been noted. But the Chinese are leaving the country and raw Kaffirs are coming to the mines. From the point of view of colored labor, the outlook for decreased costs is by no means favorable. If the raw Kaffirs would only stay on the mines for a few years, instead of months, it would be possible to get costs down, but soon after he learns his work, the Kaffir leaves for home, and the mine management must start with a new lot. The working costs in the future will vary with the ebb and flow of Kaffir labor.

What is often obtained only by strikes in other parts of the world has been freely given to the artisans on some of the mines, namely a reduction in working hours. Since the first of November, the working hours of mechanics and others employed on the surface of the mines controlled by Eckstein & Co. have been reduced from 56 per week to 51. Under the new arrangement the mechanics, carpenters, etc., commence work at 7 A. M. and continue until 12 M. An hour is given for lunch. In the afternoon they work from 1 P. M. until 5 P. M. These hours are for five days per week, and on Saturdays the men work from 7 A. M. until 1 P. M., receiving pull pay for this short shift. The reduction of hours does not affect the mill-men, cyaniders, or engine-drivers, all of whom have had eight-hour shifts for years past. The concession has made a very good impression on the men, and it does not look as if the mines would suffer in any way.

The Central South African Railroads Co. is starting a scheme that well might be copied by the mines, namely the planting of large plantations of different kinds of wood, to produce 'sleepers' (ties) for the railroads in the future. South Africa, on the whole, is a forestless country, but it has been proved that most kinds of trees can be grown on the veldt. Were the mines to tackle this problem, there is little doubt that the Transvaal could in time produce all the timber required for underground work. It is difficult to get mining people to see the important relation between mining and afforestation. Trees planted today might benefit the next generation, but the motto

of mining too often is "Let posterity take care of itself."

On the whole the results from the mines for October are satisfactory. The total output from the Transvaal was declared to be 553,553 oz., valued at £2,351,344, of which the Rand's contribution was 532,933 oz., valued at £2,264,010. The October output falls short of the record by 1474 oz., and there seems little doubt that the high-water mark of the Rand output has been passed. As the outcrop mines die out, the output of gold will become less and less. No deep levels seem forthcoming to take the places of the star outcrop companies.

The Robinson Gold Mine takes the lead in October, with an output of 25,298 oz.; the Simmer & Jack is second with an output of 25,068 oz.; third on the list comes the Robinson Deep, which turned out 19,708 oz. The amount of waste rock sorted out does not appear to be as high as formerly. The Consolidated Langlaagte mine apparently finds it cheaper to do away with sorting and crush everything that comes from the mine. The Lui-paards Vlei Estate again takes the lead as far as duty per stamp is concerned. They report the very high figure of 8.8 tons per stamp per 24 hours. Next to this figure is that of the Glen Deep, with a crushing per 24 hours of 7.59 tons. The influence of tube-mills is readily seen in the far higher stamping duty now attained on the Rand.

London.

Progress in Cornwall.—Reopening Old Mines.—Difficulties in Pumping.—Geological Studies.—Age of the Formation.—Tin and Copper.—Methods of Dressing.—Witfley and Wetherill.—The Elmore Process.—Good Results.

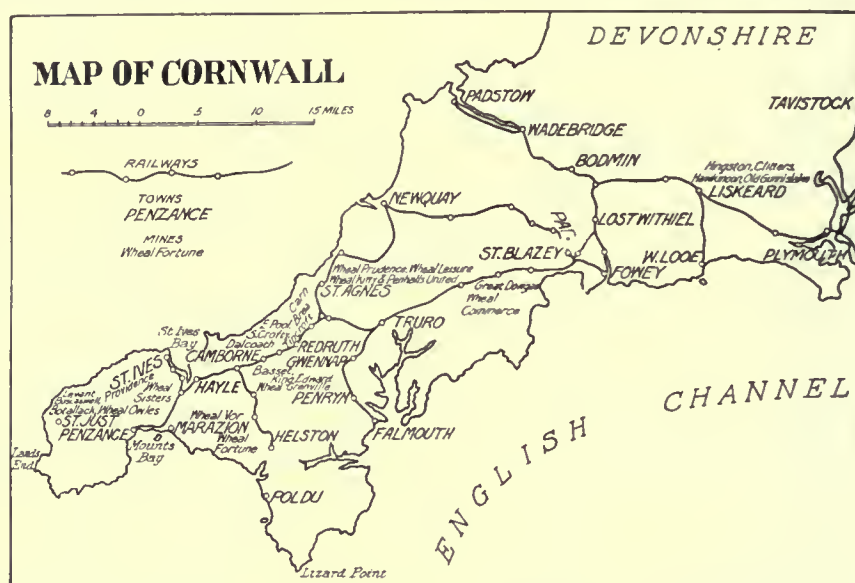
The unwatering of the old mines in Cornwall, which are being reopened, is giving a great deal more trouble than either Cornishmen or outsiders expected, and is accountable for much of the delay in increasing the output of tin. It is usually supposed that Cornishmen look askance at new inventions and new ideas, but this is quite a mistake. When making designs for a plant to unwater the old mines, they listened quite readily to the representations of the makers of electric turbine pumps, and a number of these pumps have been installed. At Tywarnhaile the first electric pump put down in the Duchy gave a great deal of trouble, and after more than a year's work, is still not exactly satisfactory. The Parbola mine and Great Wheal Busy are suffering even more. At Parbola they have spent double what five previous companies spent at various times in reopening the mine, and they have not reduced the water-level more than a hundred feet. At Wheal Vor, which is being reopened by the Dolcoath people, the experience with electric pumps has been very sad, and already £33,000 has been spent and nothing done. The pump-makers admitted eventually that their design was an entire failure, and they are supplying a new plant to take its place. Of course, the whole of the above named sum was not spent in pumping. A good deal of the expenditure has gone in clearing out old shafts and levels, and in erecting machinery and dressing plant. The Cornish mines offer other water difficulties besides those that come in the wake of unsatisfactory electric pumping installation. In reopening some of them it has been found that pumping makes hardly any impression on the water. The slates are so fissured, and old workings are so interconnected, that the water is more like an underground lake of great area. Some years ago a fortune was spent to no purpose in trying to unwater some mines near St. Day. It was found that the pumps were trying to drain an area of twenty square miles.

While writing about Cornwall, it is of interest to men-

tion that the new Geological Survey maps and memoirs of Western Cornwall have been published during the current year. There are three volumes of memoirs. One deals with the district that includes Land's End, Penzance, Marazion, and St. Ives. A second covers the district from the Lizard and Falmouth to Camborne and Redruth, and a third includes the district of St. Agnes. The surveys and investigations have been made by Messrs. J. B. Hill, Clement Reid, J. B. Scrivenor, J. S. Flett, D. A. MacAlister, and others. The books are naturally of great interest, especially at this time when Cornwall has in the past suffered from the absence of detail in the studies of its rocks on the part of the Geological Survey. In the old days, geologists were almost solely paleontologists and the geology of a district like Cornwall, where no fossils are found, did not hold out any attractions. The old Geological Survey never seriously tackled the rocks west of Devonshire and Plymouth districts. The slates of those districts were studied and placed in the Devonian series and, without any serious investigations, the slates of West Cornwall were thrown in with them. The present Survey remedies this state of things. The slates, or killas, to give them their local name, have been moved farther down the table and put provisionally among the Ordovician series, though naturally the entire absence of fossils makes it difficult to place them exactly. The Survey, on the other hand, has deemed it best not to depart from the word 'greenstone,' or to give this intrusive rock any more modern name. The word still describes the rock in the most useful way. The memoirs give interesting accounts of the contorted killas, the intruded sills of greenstone, and the subsequent intrusions of the granite, the elvan dikes, and the mineral veins. They also give a good deal of information about the metaliferous lodes, but not sufficient to satisfy a mining man. It is stated: "The mines are now to a great extent worked out and abandoned." I am inclined to join issue with the geologists with regard to the words "worked out," and to ask for more specific evidence to support this somewhat drastic judgment. My own experience of abandoned mines in Cornwall is that they were abandoned not because the ore deposit had given out, but for other and different reasons. In fact, I do not know any tin lode that has given out in depth. The old Cornishman worked a lode as long as he could find a clean tin ore or a mixed tin and copper that could be separated by hand. The separation of tin and copper could not be effected mechanically in those days. If wolfram came in, the deposit was abandoned. Unless the tin or copper was of a certain grade, developments were soon discontinued, for there was not sufficient capital to work low-grade ores on a large scale or to bridge over periods of unprofitable returns. In many cases, work had to be abandoned because a depth had been reached where new hauling and pumping plant of greater cost than they could afford became necessary.

It will be seen from these remarks that it is difficult to generalize on the subject of abandoned Cornish mines. No records were ever kept by the old miners and the exact circumstances of the abandonments cannot be ascertained. It is just this uncertainty that makes their reap-

ening a more risky speculation than developing new prospects from the surface. It is readily admitted that the richer deposits of tin and copper near the surface are worked out, but there are left behind great quantities of complex ores, useless at one time, but now amenable to treatment. A mixed ore of tin, arsenical pyrite, and copper pyrite, could not be treated on the old buddles, but the Wilfley table gives a very good separation. Similarly, tin could not be separated from wolfram. This is remedied by the provision of the Wetherill magnetic separator, and though as yet the separation is not thorough, mixed ores that were formerly useless are now being worked at a profit. What promises to be the most valuable process for Cornwall is the Elmore vacuum-flotation process and it would not be surprising to find that it solves a good many knotty problems of ore treatment. A plant is in operation at Dolcoath, where some complex ore that has been exposed in the upper levels for decades is being treated with most interesting results. The ore is a mixture of pyrite and other sulphides containing 2 or 3% copper and some arsenic, together with



from 10 to 20 lb. black tin per ton. It is treated first in the vacuum plant, which removes over 90% of the sulphides and produces a concentrate containing 15 to 20% copper, together with the arsenic. The tin is unaffected and passes out in the tailing. The concentrate is first burnt to remove the arsenic and is then disposed of as copper ore. The tailing containing the tin goes to the dressing floors. This ore contains no wolfram. Any wolfram in the ore would pass away with the tin in the tailings and would be recovered with the tin, and the mixture would be separated in the Wetherill plant. In this way it will be seen that an ore containing tin, wolfram, copper, and arsenic, would be perfectly amenable to treatment. At South Crofty there are ores of this sort, but by their system of dressing a good deal of the iron from the pyrite is removed in the magnetic separator. This introduces a complication in separating the tin from the wolfram and makes the study of the machine all the more difficult. For some reason the tin has a way of going with the wolfram, and the engineers allege that it is the iron in the mixture that is the cause. If this is the true explanation, the provision of a vacuum plant would obviate the drawback, for practically the whole of the iron would be removed before the tin and wolfram mixture went to the magnetic separator. It is possible that the presence of iron is not the true or the whole reason for the tin going over, but that the eddies of air set up by the two belts traveling past each other so close together may contribute to the extraction of some of the

tin with the wolfram. In any event the previous extraction of the iron by an entirely different process would improve the treatment.

Butte, Montana.

Ore Production of Boston & Montana.—The Washoe Plant Idle.—Rich Ore in the Lizzie.—Butte & London.—Barnes-King Fiasco.—Suit to Be Brought.—Surprise Eagle.—Gold Mining.

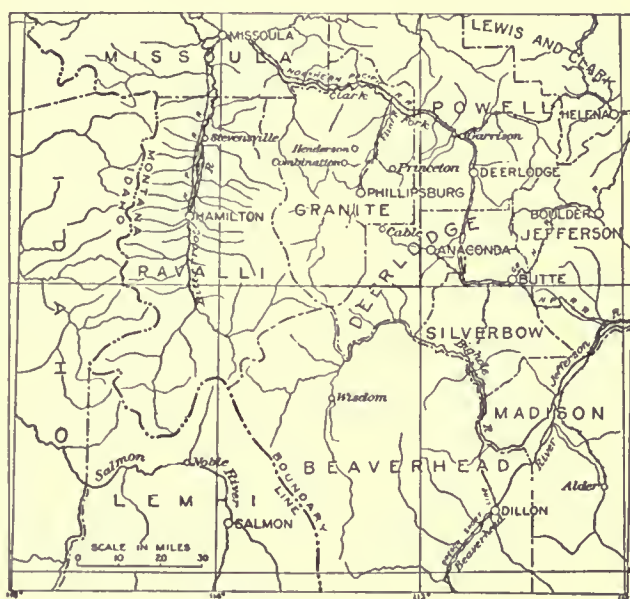
Although the Amalgamated company has been transferring its working forces to the mines and smelter of the Boston & Montana Co. since the closing of all its other mines, the Boston & Montana is not yet producing to its full capacity, and probably will not for some time yet. The ore production of that company has been more than doubled, but its capacity is about 3600 tons per day. The December copper production of the Butte mines will be about a million pounds less than in November, but the loss is likely to be made up in January. The Washoe smelter at Anaconda has been closed tight, and that city, which depended almost entirely on the smelter for support, is suffering the brunt of the shut-down. The outlook for an early resumption of operations at the mines is not good. An official of the Amalgamated says the only influence that prompted a shut-down and a concentration of operation and expenses in the Boston & Montana Co. was necessity. He says the smoke suits pending against the Washoe smelter had nothing to do with it. The company was losing a great deal of money in keeping both large smelters running, as the cost of production was greatly increased under the curtailed operation. By transferring all production to the Boston & Montana that company's mines and smelters can be run to full capacity, the cost of reduction can again be reduced to the normal, and the company can make some profit at present copper prices. The fact that the Clark mines have also reduced their output fully 50% is cited as evidence that curtailment and economy are the causes of the Amalgamated shut-down. The people of Butte and Anaconda are feeling very blue over the situation.

The rich vein of copper ore found in the Lizzie claim by lessees has been developed and is found to grow in importance as exploration proceeds. It is accepted as certain that the vein will be found large and immensely rich at sufficient depth. The Lizzie claim is owned by the Davis-Daly Estates, and it is reported that the company expects to be able to resume development work on the Colorado claim, which is near the Lizzie, and to develop the veins in the latter ground from the 1000-ft. level of the Colorado. The Davis-Daly, like many other new companies, has been compelled to suspend exploration and development work because of the financial stringency, but the managers have hopes of raising money soon with which to resume work. It has been stated that the Davis-Daly had a considerable sum of money tied up in the suspended State Savings bank of Butte, but the report of the State bank examiner shows that the company has only \$7750 on deposit in the bank, though the vendors of the property, who organized the company and contracted to furnish a fund for the Davis-Daly Co., have \$45,500 on deposit.

The Butte & London Co., one of the well managed and well financed new companies, is still prosecuting exploration work on the 1100-ft. level of its property. Three veins have been cut and drifts are being advanced on two of them. Both are well mineralized, and H. V. Winchell, consulting engineer to the company, has advised a continuance of the driving, for, in his opinion, commercial ore will be found in at least one of the veins. Cross-cutting is also being continued and will be carried to the limits of the company's ground, which is 1500 ft.

in each direction from the shaft. The company is still well supplied with funds and expects to be able to continue exploration work until money conditions improve and new funds are available.—The Colusa-Leonard Extension Co. has practically stopped development work in its property, but it has opened a fine vein with a 14-in. streak of high-grade ore in a lode seven feet wide. When money conditions get better the company will sink the shaft, which is now 800 ft. deep, to a depth of 1500 feet.

The directors of the Barnes-King Development Co. have replied to a demand from a large number of stockholders that suit be brought against the promoters and underwriters to recover money alleged to have been obtained from the subscribers by fraud, and the board has signified its intention to comply with the demands and bring such a suit in the name of the company. It is understood that details are now being gathered for that purpose and that some attorney who is not a stockholder



Montana.

and who has never acted as attorney or counsel for any of the big parties interested in the Barnes-King, will be retained to prosecute the case. The suit, if brought, will be against the New York syndicate of underwriters, the A. J. Campbell estate, and the members of the first board of directors, as well as the Butte men who assisted in the flotation of the alleged fraud. The reports from the mines of the company grow worse instead of better, and it appears doubtful now whether the company will ever earn anything.

The Surprise Eagle Mining Co. has started work on the Morning Star mine, in Jefferson county, five miles east of Boulder. It has a shaft 200 ft. deep, from which considerable high-grade silver ore has been mined above the water-level on a vein 14 in. wide. The company also owns several other properties in Jefferson county and a full claim in the Butte district, upon which a vein of copper ore, 2 to 6 ft. wide, has been opened.

About the only mining that is done in Montana at a good profit now is in the gold mines and placers. The Southern Cross Mining Co. has just made another clean-up, the second in two weeks, and has shipped to Butte two bricks, one weighing 24 lb. and the other 11 lb. The company has built a mill and cyanide plant. The shaft on the Southern Cross is 200 ft. deep, and the orebodies have been opened at that depth by cross-cuts and drifts. It is claimed there is enough ore to keep the mill running for four years, the mill having a capacity of 100 tons per

day. The stamp-mill has been rebuilt. The cyanide plant is equipped with all the latest appliances, including the Moore filter for treating the slime. The company has expended about \$100,000 on its mill. Before the company took hold of the property lessees had worked it and taken out \$350,000. Until the adoption of the Moore filter the company experienced great difficulty in saving the gold, as it went off in the slime. It is claimed by the company that the Southern Cross ore now being mined assays on an average about \$8 per ton in gold.

Salt Lake. Utah.

Smelter Smoke and Farmers.—An Adjustment by Blackmail.—The Tintic Smelter.—Garfield Concentrator.—Lowering of Wages.

At this writing it is not known whether an agreement will be reached between the management of the Utah Consolidated and the farmers of the Salt Lake valley respecting the operation of the Highland Boy smelter until March 1, 1909. However, there are prospects of an understanding being reached, in which event a stipulation will be filed with the Court for a modified decree permitting the smelter to be operated during the period stated, which would give the company sufficient time to construct its proposed new smelter in Tooele county. First the farmers demanded a bonus of \$175,000; the directors of the Utah Consolidated offered to pay them \$100,000 and in addition make good any damage that might accrue to vegetation; this the farmers refused to accept but they came back with a second proposition expressing a willingness to split the difference in the matter of bonus. The matter was then passed up to the directors of the company for the second time, and this time for final disposition. Should the proposition be turned down, the smelter will close as soon as the injunction of the Court becomes operative; while on the other hand, if the compromise is accepted, it will mean that the plant will continue in operation for another fifteen months or until the date stated. Based on a bonus of \$100,000, the plaintiffs in the smoke case would draw down approximately \$7.50 per acre on their lands, situated within what is known as the smoke zone.—The smelter of the Bingham Consolidated is all but closed and the fires will be totally extinguished by the end of the present week. The Bingham smelter was the second copper plant erected in the Salt Lake valley and is the first one to go out of business as a direct result of the decision of the Federal Court in the smelter smoke case. It is also probable that the United States copper smelter will also be closed, as has already been announced by the management of that corporation; however, it is not improbable that some arrangement will be made like that of the Utah Consolidated, provided the latter is successful in its negotiations.

The Ohio Copper Co. has filed a copy of its articles of incorporation with the Secretary of State. The organization is capitalized for 1,000,000 shares of the par value of \$10. The company's properties are situated at Bingham.—The aerial tramway of the Tintic Mining & Development Co., at Bingham, has been placed in operation, and hereafter the ores of the Yampa mine will be transported direct to the smelter at lower Bingham.—The building of the new lead-silver smelter of the Tintic Smelting Co. is to be pushed as rapidly as possible. Jesse Knight, one of the leading spirits in the enterprise, says the plant will be ready in April, and that a large portion of the equipment is now on the ground.—The Garfield concentrating mill of the Boston Consolidated Mining Co. will be started toward the end of the week. Three sections of the plant are ready. Each section will treat 500 tons of ore per day.

The ore shipments from the Tintic district last

week amounted to 91 carloads, the contributing mines and respective amounts being: Bullion Beck, 3; Carisa, 1; Centennial Eureka, 50; Colorado, 1; Eureka Hill, 3; Mammoth, 8; May Day, 2; Scranton, 4; Tetro, 1; Tintic Iron, 10; Yankee Con., 8 carloads.

Denver, Colorado.

Coal Strike Ends.—The Drainage Adit Resumed.—Doyle and Burns.—In the San Juan.—Christmas Dividends.

The local coal strike has been declared off by the officers of the United Mine Workers of America. The union, although successful in making its point against the wagon mines, could not force the mines that shipped by railroad to accede to its demands. The wagon-mine operators, seeing the situation as it really is, have cut wages nearly to the former schedule. The unimportance of the field and the condition of the labor market made it useless for the union to continue the strike.

Arrangements have been made between the Cripple Creek Deep Drainage Tunnel Co. and W. M. Bainbridge, superintendent of the El Paso mine, by which the latter as an individual is to continue the work on the adit until the Tunnel company can let a new contract. The specifications of the new contract are practically the same as in the first. The adit must be pushed at the rate of not less than 750 ft. every three months until the intermediate shaft has been sunk to the adit level. When this is done, work is to be pushed both ways from the shaft and also from the portal end at not less than 1500 ft. for every three months until connection is made with the portal. The intermediate shaft is 8000 ft. from the portal of the adit and is now down 90 ft. The contract specifies that the remaining 600 ft. shall be sunk and timbered at not less than 209 ft. for every three months. The tunnel is to be continued 7 by 10 ft., as at present, or it may be of circular cross-section, 8 ft. in diameter. This last condition makes it possible to entertain a bid from a Denver firm having a newly patented tunnel-boring machine. A forfeiture clause is inserted and the contractor has to give a \$20,000 bond on the adit work and a \$5000 bond on the shaft.

James Doyle has scored a new victory in his long-standing and now famous suit against James F. Burns, of Colorado Springs, for the recovery of \$447,000 worth of stock in the Portland Gold Mining Co. Doyle alleges that this stock, which is rightfully his, was withheld from him by Burns. The suit has had many sensational turns during the past six years, and promises to be dragged through the courts until the Portland Gold Mining Co. has ceased to exist. The new trial allowed to Doyle will be started at once in the District Court at Council Bluffs, Iowa.

Of the mines in the San Juan district only the more profitable are being operated. Among the most important to be closed for the winter are the San Pedro, Gold Prince, Aspen, Champion, and the Detroit & Colorado. The closing of these mines has thrown about 350 men out of employment. Most of these have left the district in search of work elsewhere. On Dec. 20 the Propatria mill at Rico was put in operation, and the whole town took occasion to celebrate the event. The mill has a capacity of 100 tons per day, but, owing to the low price of the metals, only 50 tons per day will be treated until prices improve. The United Rico Mines Co. has fully a year's supply of ore developed for the mill.

Many of the Cripple Creek companies paid extra Christmas dividends to their stockholders. The Work M. & M. Co., the Elkton Consolidated, and the British American Mining Co. each made the extra dividend one cent per share.

Torreon, Mexico.

The Peñoles Mines. — Picturesque Engineering. — The Smelting Plant.

The general offices and smelting plant of the Peñoles Mining Co. are at Mapimi, Durango, situated some 20 miles westerly from Bermajillo station on the Mexican Central. The narrow-gauge railroad extending from Bermajillo to Mapimi is the property of the Peñoles company. The company's mines are high up in the limestone hills about six miles distant from the smelter. A 36-in. gauge railroad connects the smelter with the mines, the centre of the mining operations being known as Ojuela. The last mile or two of this railroad, that extending from the foot of the hills to the mines, is a cog-road having a maximum grade of 14%. Hauling supplies and ore over the latter section is done with a powerful walking-beam rack locomotive engine, which is of the Abt type and a Swiss patent. This engine makes 18 trips per day over the cog section, hauling four cars of ore, or 30 to 40 tons at a trip. The principal ore-bins are at the upper terminal of the cog-road. The cars, passing under the chutes, are loaded by gravity. Tracks from the different shafts centre at these ore-bins. In order to transport the ore from one of the main shafts, a suspension bridge, having a 1,030-ft. span, was built across a deep gulch to support the track. The vast silver-lead orebodies, which occur as chimneys in the line, are opened by six vertical shafts and a number of winzes. There are 18 levels connected with the shafts. The deepest workings extend to about 3,000 ft. in depth.

The ores are both oxides and sulphides and the line of demarcation between the two is somewhat variable in different parts of the property. In general, it is claimed the sulphides are first encountered at a depth of about 1,750 ft. The minerals in the ore include arseno-pyrite, galena, sphalerite, fluorite, hematite, barite, cerussite, anglesite, and calcite. Approximately, the contents average 17% lead, 20 oz. silver, and 0.2 oz. gold per ton. The exploratory work is entirely with diamond-drills, of which there are now 17 in operation. In this work the ground is blocked out 120 metres square and 60-metre horizontal holes are driven with the diamond-drills from opposite sides. This is the deepest mine in Mexico and some of its old workings are said to date back to the middle of the sixteenth century. The Peñoles Mining Co., controlled by capitalists at Frankfurt, in Germany, began operations here in 1893. For the year 1906 the ore hauled from the mine to the company's smelter amounted to 140,000 tons. At present 1,100 men are employed at the mines.

The smelting plant contains six water-jacketed blast furnaces, each 46 by 162 in. at tuyeres, and 21 ft. 6 in. high, the capacity of each furnace being about 150 metric tons per 24 hr. The furnace charge contains 20% silicious ores which are purchased and shipped in from outside mines, as the Ojuela group produces no silicious ores. An electric crane is being completed to handle the slag in 6-ton units to two reverberatory matte-separators, each of 1,000 tons capacity of material per day. The furnaces are now fed by hand, but early in 1908 the charge will be made up from 10,000-ton storage-bins into 4-ton units of charge and hauled by electric locomotives over steel trestle-tracks to hopper-bins above the furnaces, supplanting hand by mechanical feeding. The bullion is taken liquid from the furnaces to three 45-ton drossing-kettles in which it is purified for casting into bars for shipment to refineries. The blowing machinery consists of two No. 10 Connorsville blowers, direct connected to a Rice & Seargent tandem-compound steam-engine; and a

Nordberg engine does similar duty. They have five No. 7 blowers in reserve. The plant also contains a Huntington-Heberlein converter apparatus of twelve 10-ton pots, which are operated in connection with six Wetthey roasters. This roasting and converting plant reduces the sulphur in the sulphide ores that come from the lower mine levels before it goes to the blast-furnace charge. The operating staff of the Peñoles company is as follows: General manager, Kuno B. Heberlein; superintendent of smelter, H. S. Mulliken; superintendent of mines, O. R. Whittaker.

Denver, Colorado.

The Newhouse Tunnel.—The Cripple Creek Strike.—Survey Work at Aspen.—The State School of Mines.

The famous Newhouse tunnel has been connected with the shaft of the Old Town mine. When the connection was finally made on Dec. 8, Idaho Springs celebrated by ringing of bells and blowing of whistles. To accomplish this engineering feat the adit had to be driven 14,900 ft. and a lateral extended 4326 ft. The connection was made 2184 ft. below the collar of the Old Town shaft, where a station has been cut and bins got ready for the ore that is to be shipped through the adit at the earliest possible date. During the last year the lateral was driven 2492 ft. and the Old Town shaft sunk and timbered 586 ft. H. Brown, the surveyor who has had charge of the engineering work, deserves credit for the close connection finally made.

W. D. Haywood, secretary of the Western Federation of Miners, has at last officially declared the Cripple Creek strike to be at an end. While it is recognized among mining men that this action will have no effect upon the present conditions at Cripple Creek, it is of advantage to the members of the Federation. They may now go to this district and apply for work. The trouble at Goldfield is evidently the reason for calling off this protracted strike. As far as Cripple Creek was concerned, the strike was practically settled when the organization known as the Western Federation of Miners was driven from the district after the Independence depot outrage in June, 1904. The recent trials of Moyer, Haywood, and Pettibone in which Harry Orchard's testimony has figured so prominently have served to refresh the memories of the Cripple Creek operators. The Federation need not expect to gain a foothold in this camp again, as the card system is being rigorously enforced just now by men who have had a bitter experience.

The operators and prospectors of Aspen have taken notice of the project to ask the U. S. Geological Survey to make a map of Summit county, and a petition is now being circulated at Aspen. The district has outgrown the original geological map, and there is need of some more work being done there, especially to the south.

The annual report of the Colorado School of Mines has been submitted to the Governor. The report shows the school to have passed a very prosperous year. The \$35,000 set aside by the Legislature last April has been partially expended on the new building, which is to contain the offices, gymnasium, natatorium, and club-rooms. Graduate courses in mining and metallurgy have been added to the curriculum; 329 students are in attendance of which 58% are registered from Colorado, which makes them free as far as tuition is concerned. After September, 1908, the tuition will be raised from the present rate of \$100 to \$150. Notable features in the report are the plans for a very complete testing plant to be built as soon as the funds can be secured, and the opening of a real mine as a laboratory for the students. This is the first mining school to have such a mining laboratory.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

THE STAMPS at the new 300-stamp mill at the Simmer Deep property weigh 1,750 lb. each, this is 500 lb. above the average weight of stamps on the Rand.

IN SONORA, the Douglas Copper Co. is using traction engines successfully, making trips of 50 tons each. Four outfits make the round trip of 20 miles each way in 2½ days, from Cobre to Fundicion.

THE SHAFT-SINKING record at Butte, Montana, for a three-compartment shaft is 125 ft. in 30 days. This record was made at the Pilot-Butte shaft in November. The country rock at Butte is a granite.

ROPE for transmitting power has displaced gearing and belting in a great number of installations. The cause of late acceptance of this cheap and ready method was the lack of reliable and sufficiently flexible rope of reasonable endurance.

RECENTLY an electro-chemical method has been perfected whereby atmospheric nitrogen is oxidized to nitric acid. It is used in Norway where nitrate of lime and soda are being manufactured at the rate of 1000 tons per year. This nitrate of lime is said to constitute a superior fertilizer.

THE countries possessing the best mines of arsenic are: Germany, England, Austria, France, Italy, Spain, Portugal, Norway, Siberia, New Zealand, Chile, Mexico, Canada, and the United States. Germany produces the largest quantity of metallic arsenic and arsenious acid. England held first place in 1902, but has fallen far behind. The United States consumes more than one-half of the world's production of metallic arsenic.

THE ore sent to the 100 stamps in the mill of the Batopilas mines, in Mexico, ranges from a minimum of 4 oz. to a maximum of 10 oz. silver per ton. The silver is mostly in a free condition, that is, native. The stamps are light and crush one ton per day, the pulp being concentrated before another amalgamation treatment, while the tailing from this amalgamation goes to roasting furnaces and hyposulphite leaching vats. The mill is run by water-power, and the company is blessed with a mechanical genius and a machine-shop. That is why 4-oz. silver ore can be handled profitably.

A LARGE DEPOSIT of vanadium sulphide ore has been opened in Peru. Mining conditions are easy and the ore is transported to the port of Callao. Five large veins have been proved on the property. Vanadium, which is used in hardening steel, has generally been referred to as a rare element; but it is very widely distributed, being a constituent of most clays. However, it could be produced in few localities and small quantities only. The development of the Peruvian deposit and the erection in Pittsburg, Pa., by the American Vanadium Co. of works having a daily capacity of 2000 lb. of vanadium alloys seem to settle the question of commercial supply.

POTASSIUM CYANIDE is rapidly decomposed by water containing large amounts of mineral matter; but frequently such water must be used in cyanidation. This decomposition of cyanide is easily overcome by using a proper amount of alkaline re-agents. The effect of soluble salts of aluminum, calcium, and magnesium is to

destroy the cyanide not only directly, but also indirectly; they destroy the protective alkalinity, which fact allows even carbon dioxide from the air to decompose the cyanide; they directly act upon the cyanide itself, as the following formula indicates: $\text{MgCl}_2 + 2\text{KCN} + 2\text{H}_2\text{O} = \text{MgO}_2\text{H}_2 + 2\text{HCN} + 2\text{KCl}$.

THE use of wood in smelting copper-sulphide ores has been fairly successful at the Mitchell Mining Co.'s mines in Guerrero, Mexico. In operating a 200-ton smelting plant, it was endeavored to dispense almost entirely with the use of coke, pending the construction of a railroad. Various experiments with one-third oak blocks, one-third charcoal, and one-third coke were not very successful. Using two-thirds wood and one-third coke, the product was a matte of about 28 to 30%, whereas with a full coke charge the furnace made a matte of about 40%. By dipping the wooden blocks in a thin paste of silica and clay a much higher concentration was obtained, making a matte of 38%. After securing that excellent result the company continued to smelt with wooden blocks alone, but did not get from the furnace the full smelting capacity that it would with the full coke charge.

ARTIFICIAL abrasives suitable for grinding purposes were unknown before the invention of the electric furnace; but the manufacture of alundum was begun by the Norton Emery Wheel Co. of Worcester, Mass., in 1904. Its chemical composition is the same as that of natural corundum. The process of making it consists in taking the mineral bauxite, purifying it and melting in an electric furnace into a large homogenous mass. Upon cooling this molten fluid crystallizes in solid masses of alundum of great purity and uniformity. After crushing and sizing it is manufactured into grinding wheels and blocks, polishing stones, etc.; the powder is used for cutting and drilling rubies and sapphires for watch jewels. The production of alundum has been as follows: In 1904, 4,020,000 lb. valued at \$281,400; in 1905, 3,612,000 lb. valued at \$252,840; in 1906, 4,331,233 lb. valued at \$303,186.

THE freezing process sometimes employed in shaft sinking consists in building a wall of ice around the shaft from the water from which trouble otherwise would arise. The ice cylinder must be sufficiently strong mechanically to withstand the stresses brought against it by the working of the ground, the motion of the water, and sinking on the inside. No rule can be given as to the thickness of the wall, as many variable factors enter into the equation. The temperature must be reduced to a considerable number of degrees below freezing point. The refrigeration is effected by a ring of vertical pipes fixed in the ground and containing water to be frozen. The tubes are placed usually from 3 to 4 ft. apart, the number varying with the diameter of the ice cylinder to be formed. The freezing arrangement consists of two concentric tubes; the bottom end of the outer one is closed and the bottom end of the inner one is sometimes fitted with a strainer to prevent the passage of grit. The greatest difficulty of the process is in the fixing of the tubes in an absolutely vertical position. Where rock or clay has to be passed through, holes are drilled, or bored with a sharp-edged tube; they are lined with guide tubes, inside of which the freezing-tubes are fixed. The inner tube is usually from 1 to 1½ in. in diameter; the size of the outer tube will vary with the depth, thickness, and diameter of the ice cylinder for the cooling action of the pipes (in which cold brine is circulated) is proportioned to the surface of pipe exposed to the stratum and the water contained in it.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

Assessment Work.

The Editor:

Sir—In our ramblings for a prospective mine, hardship, privation, and uncertainty, with which is included financial stringency, are constant troubles always with us, none of which have as yet prevented the performance of annual assessment upon promising showings. In my experience, supplies have always been forthcoming in sufficient quantity to enable one to do his annual representation work whenever the value of the showings warranted it. The failure of a person to get necessary supplies, to enable him to perform his assessment work, indicates characteristics foreign to the real prospector. Such a person, if examined closely, would most likely be found to belong to the class known as 'locators,' men that run pell-mell into the field of new discoveries and locate everything in and out of sight, with the aim of sitting back and selling on the strength of proximity to the original discovery, upon which the discoverer is rarely found wanting, in doing his assessment and demonstrating real values. The prospector has mostly performed his assessments by this date, and most likely is suitably located for trapping, drifting, sluicing, or rockling a few dollars out of nature's bank to carry him over the year 1908.

JAMES BRINDLEY ROWLEY.

Galice, Oregon, December 6.

Hang-Fire.

The Editor:

Sir—In your issue of November 9, under 'Concentrates', you mention that there was practically no danger of hang-fire where electric blasting was used. Several instances, in railroad work, have come to my notice where charges of black powder have hung fire when exploded with the electric battery and a few sticks of dynamite. On the Columbia Falls North line of the Great Northern an assistant engineer was killed from this cause. Two pockets had been loaded with about ten kegs each of black powder, and but one pocket went off on time, the second one hanging fire about five minutes. The engineer had thought that the danger was over and started to go over the cut when the second pocket exploded. The reasons advanced for the accident were that there was not enough dynamite used as an exploder or that the charge was loosely packed and the dynamite served only to set fire to a train of black powder, which had to burn to the packed charge before the same would explode.

F. T. HOWES.

Scott, Wash., November 21.

A Sampler.

The Editor:

Sir—In your issue of November 9, Mr. C. Y. Knight, by means of a letter published in your journal, made known his want of a sampler for wet sand, and since no answer from dealers in cyanide supplies has yet been printed I presume that such an article is not on the market. The question interested me, not only because I have for a long time considered the sampler described to be a very accurate one, but because there are still in use (in various cyanide plants) samplers of the whole or part tube type.

It is a well known fact in gold and silver cyanidation

that the extraction in the different horizontal layers of sand decreases with the depth of the layer, so that the top part of the vat represents the layer of best extraction and the bottom the lowest. I know of no sampler other than that of the screw type described by Mr. Knight that is capable of giving a perfect sample of wet sand in place, and by its use over a period of several years I have seen the theoretical figure for the extraction obtained from headings and tailings of sand come within 1 or 2% of the actual extraction obtained from headings of sand and bullion produced.

On the other hand, I have seen gross discrepancies in these figures as the result solely of the use of poor samplers. These results are often wrongly attributed to solution leakage, vat absorption, theft, etc. These samplers are fragile and hard to make and the best plan is to always have an extra one in stock ready for emergency.

I do not believe that they are on the market, at least I have never seen them, but there should be a good sale for them, and it is up to the dealers to get busy.

FRANK W. OLDFIELD.

Los Angeles, December 5.

Prospecting With the Diamond-Drill.

The Editor:

Sir—I have seen several articles in mining journals in which the writers have asked whether the richness of the ore will increase or pinch out, as a greater depth is reached, in the mines of Goldfield. I have heard the same question asked by many people. I ask the question, why don't some of these enterprising companies find out?

Why not use a diamond-drill to sink a bore to a depth of 4000 or 5000 ft. or several bore-holes to get complete results? The information so obtained would prove interesting and possibly surprising. Dozens of holes have been sunk to depths ranging from 4000 to 5000 ft. on the Rand in South Africa. One hole was bored at Doornkloof near Randfontein to a depth of 5560 ft. in 14 months, working 24 hours per day; extracting a core of 2 in. down to 700 ft.; in drilling the remaining 4860 ft. a smaller sized bit was used, removing a 1½-in. core. Another hole with a record of 5582 ft. was completed in 9 months, and still another hole was bored near Johannesburg to a depth of 6340 ft. The mining companies there were of the engineering type. They wanted to know, when the shallow workings were exhausted, if the reef persisted at greater depths, and if so, whether it was worth the heavy expense of sinking an operating shaft to these depths. The diamond-drills have answered their questions in the affirmative, prolonging for a long time to come the existence of that important mining field. It is up to some of the Nevada districts to do the same and answer these questions.

I doubt if there has been a half dozen holes bored to a depth greater than 2500 ft., and I have no knowledge of any diamond-drill hole in North America to a greater depth than 3000 ft. I also wonder why it is that the drills have not been used to a greater extent than they have in this country. The mines on the Mother Lode in this State have merely scratched the surface. The Kennedy is (as far as I know) the deepest mine. The owners of one mine spent ten years looking for pay-ore, which they could have found long ago by the systematic use of a diamond-drill. Another mine in the same locality, sank a shaft 1900 ft., cross-cutting every 100 ft., spent \$1,000,000 and took out \$25,000 worth of ore. This mine today is for sale for a song. I firmly believe there is good ore to be found on the property. A good

prospecting with a drill would have proved the ground to a greater depth and at a cost of \$25,000 or less, as against \$1,000,000. I venture a prophecy: At some future time the Mother Lode of California will be re-prospected and abandoned properties will again be producing at a much greater depth.

To a man who has followed the diamond-drill in various countries, geological reports are very misleading and inaccurate when taken from surface indications; for surprising results are obtained from holes 100 ft. apart. The successful operation of a diamond-drill is assured with an experienced and intelligent foreman, who insists that he shall get core. Why don't some of the successful men who have made their wealth in Nevada, do some deep prospecting on their properties? or do they fear the results obtained from a greater depth?

E. G. TINNEBO.

San Francisco, December 18.

Wall Street.

The Editor:

Sir—In your issue of December 7, a letter from Mr. A. G. McLaughlin defends Wall Street from the implication that it is a gambling centre. Mr. McLaughlin's statements as to banks and financial centres are true enough, but they do not seem to me to throw much light on the question whether or not Wall Street is a gambling centre; and the points he makes in the latter part of his letter are not convincing.

To discuss this question satisfactorily a mutually agreed upon definition of gambling seems necessary. Whole volumes on political economy seem not to have been able to define beyond cavil what constitutes the difference between gambling and legitimate business; between a speculation and an investment; but on Mr. McLaughlin's own understanding of gambling as "the act of hazarding wealth upon mere chance; as opposed to hazarding wealth upon mature judgment," I take issue with him and maintain that most of the trading on Wall Street is mere gambling. Which is to say, that the results of hazarding wealth on Wall Street, whether by piker or plunger, producer or parasite, to all practical intents and purposes, are determined mainly by chance.

The openly admitted purpose of nearly all these traders is to make not only a profit but a quick profit, an easy profit, and a big profit; one that is made so quickly that mature judgment seems absurdly out of place in the deal, one requiring no work for its making, and so big as to be out of all proportion to profits considered excellent in average business. The ignorance of many operators on Wall Street in regard to the corporations in whose securities they deal is such that they could tell little else of those companies than that the stocks had fluctuated thus and so in the past. They buy and sell on tips, rumors, advertisement, inside information, outside misinformation, past performances, and even 'hunches.' As for ninety days: why, the trader has got to get action on his money in less time than that if he has to sell at a loss and try something else. Did Mr. McLaughlin never meet a specimen of the genus 'tapeworm' who has "to speculate daily or die?" His name may not be legion, but in New York it is at least battalion.

The great majority of the clients of New York Stock Exchange brokers have businesses outside of Wall Street, and the buying and selling of stocks is much such a diversion to them as is poker or the ponies to the devotees of those games. Though the 'tiger' little suggests the tabby, still they are both cats. The only essential difference is in size.

As a common market-place for the convenience of those

who wish to invest in, or dispose of, the commodities there dealt in, Wall Street unquestionably has a justifiable reason for existence; but the great volume of business done there is maintained by those who are playing a game for stakes, and the influence of mature judgment as a factor in the operations is conspicuous only by its absence. My position in this is similar to Mr. McLaughlin's in that I have never purchased a security on margin nor ever traded in a bucket-shop, though I have worked for years in New York near Wall Street and have watched the game with interest from the outside. I speak merely as a man who believes in facing facts as they are.

ALBERT L. CLARK.

Long Beach, Cal., December 11.

Drill-Sharpeners.

The Editor:

Sir—In 'Concentrates' of December 7, the statement is made that hand-sharpened drills last longer than machine-sharpened drills, presumably for the reason that hand-sharpened drills get more hammering than do the machine-sharpened drills. I want to call your attention to a few facts bearing upon this matter.

To sharpen a cross bit by hand the process is as follows: In order that the drill may work easily, it is first heated to as high a heat as it will stand; then each corner is drawn out by means of a thin-edged fuller, this takes from 3 to about 8 blows from the helper for each wing, then the quarter dollie is applied to each wing and from 2 to 5 blows are given each wing; then the side-set or flatter is placed on the side of each wing; 2 to 3 blows is all that is usually given to each wing on the side, then from 2 to 3 blows on the edge of each wing, as none of these tools cover more than one wing at a time, unless a full dollie that will cover all the wings of the drill is used. In that event not more than a total of 10 blows are delivered on the dollie to cover the whole face of the bit. From this it will be seen that the minimum number of blows given to each wing is 9 and the maximum is about 20; the smith that would ask his helper to deliver 80 blows on each drill would soon find himself without a helper, and he therefore does this work with 40 blows or less oftener than he does it more. It will be seen that each wing is a separate part of the drill and is treated separately, this would show that 12 blows would be nearer the average blows given to each wing. Some smiths will pound the edges with a hand-hammer to finish it, but these men are the exception rather than the rule.

Now let us suppose that the sharpening was being done with a Word drill-sharpener; I have watched men running these machines, first two of the wings are drawn to an edge as in hand-sharpening, each wing receives from 10 to 15 blows, in this part of the work, then the dollie is allowed to strike it. The dollie used in this machine covers only two wings of the bit at one time; the hammer will strike the dollie at the rate of 400 blows per minute, but it will not take over 50 blows on each wing to do the dollie work, it is then side-set and hammered on the edges to finish the job.

As either of the hammers will strike 400 blows per minute and some men will hammer the drill as long as a minute, while others will only hammer it half a minute, if in the former case you divide the 400 by 2 (as only two of the wings are subject to treatment at once) you have from 100 blows (for the man who sharpens a drill in half a minute on each wing of the bit) to 200 (for the man who sharpens a drill in a minute).

Now take the Numa, Eclipse, or Ajax drill sharpen-

ers, which use a full dollie or one covering the whole face of the bit, and allowing that the operator puts in the same amount of time, we find that in dollie work each wing receives at least half of the number of blows struck. We find that in the three machines just mentioned the actual number of blows given to each wing of the bit is a half more, or from 150 to 250; now placing the number of blows given a drill by hand-sharpening at the maximum, you have 80; and in the machine-sharpening method take the minimum number of blows given to the drill and you have a total of from 150 to 200, allowing for the fact that some men work slower than others. Comparing these figures with your statement that the steel is improved by hammering, it would seem that the machine-made bit would be the best. This not only appears to be the fact, but it is the fact; machine-sharpened drills get from 2 to 5 times as much hammering as hand-sharpened drills. In tests made by me I have found that machine-sharpened drills would do more than twice as much work as hand-sharpened drills. To cite one instance, at the Homestake mine when I was there with my first machine, a smith was instructed to make a starter as good as he could and to exercise every care in tempering it; this he did; then a starter-drill was made with the machine and both were carefully tempered. They were taken into a part of the mine where the rock was the hardest. The hand-sharpened starter was worn out by drilling only $1\frac{1}{2}$ inches of hole, the machine-sharpened drill made a hole not over 6 in. from the other to a depth of $3\frac{1}{2}$ in. This convinced the management that the argument that machine-sharpened drills were not as good as hand-sharpened drills was without any foundation in fact.

I do not know what kind of a machine they use at the mine referred to in your 'Concentrates', but if it is a pressure machine, instead of a hammering machine then it goes without saying that machine-sharpened drills made by pressure are not the equal of hand-sharpened drills.

I trust that you will see fit to publish this letter in full, so that we may hear from others on this subject.

T. H. PROSKE.

Denver, December 10.

Volcanic Ash.

The Editor:

Sir—In your issue of October 12, under 'Concentrates,' you stated that volcanic ash is the dust caused or made by the grinding or colliding of the matter ejected from volcanoes while in mid-air. Now this is such an unusual and startling explanation that I venture to give you what is probably the correct answer. It is a well-established fact that freshly erupted lavas contain a large amount of steam or water of combination which is as essentially a part of them as any other ingredient. Some lavas, especially the more silicious, contain a larger amount of combined water than others and in the case of pitch-stone or obsidian, there is frequently 10 per cent.

Pumice is a silicious lava in which the amount of combined water was so great that it expanded below cooling and leavened it like coke or bread. Volcanic ash is simply an extreme case where the contained steam was sufficient to atomize the lava and blow it out as dust or lapilli. The source of the water or steam which causes the explosion and atomizes the lava is a much debated question, but all the evidence is in favor of it being an integral part of the earth's interior and being a gas it is slowly coming to the surface. Along great fault-planes and mountain-folds there are weak spots which serve as vents for the magmatic steam. The steam is the prime motive force of the volcanic action and acts as a flux to

reduce the fusing point of the rocks along its path. It is only the supersaturated fusions of lava and steam that reach the surface, and the higher the degree of saturation with steam the finer the lava is atomized when it reaches the air.

HIRAM W. HIXON.

Victoria Mines, Ontario, November 18.

[Mr. Hixon's objection is well taken. The definition may be amended by stating that volcanic ash is lava that has been torn into bits by the expansive force of steam, formed from contained water by release of pressure on arrival at the surface. The collision of particles in mid-air will help to break the fragments into dust, but it is a secondary cause.—EDITOR.]

The Fairmont Explosion.

The Editor:

Sir—The facts about the explosion in mines No. 6 and 8 of the Fairmont Coal Co. at Monongah, West Virginia, on December 6, when some 400 miners were wiped out of existence, are beginning to come to light.

After all the gush about "model mines," "excellent inspection," and "every safety device known to man" and the accompanying editorials about the grave limitations of the best engineers, it is a relief, although a sad one, to read the story and the lessons as plainly written by the following facts, namely:

- I. The mines were dry mines.
- II. They contained dust.
- III. They were slightly gaseous, and were in a natural-gas district, where, even if they were gas-free, a pocket or fracture containing gas might be encountered at any time.
- IV. The two mines did not have extra entries, but were connected underground for the purpose of ventilation.

These are four facts easily ascertainable and well known long before the explosion. Was it sufficient that the dust was not thought as explosive as that in the Pocahontas or New River districts? Even the ordinary layman is supposed to know that a mixture of air, coal-dust of any kind, and gas, is as deadly an explosive as was ever invented. Then, too, why was such a death-trap as an underground connection permitted?

Now, when we come to consider the cause of the explosion we have these facts:

- I. Time 10:20 A. M.
- II. Tremendous force of explosion, wrecking houses, timbering, machinery, and so forth.
- III. Path of explosion as shown by bodies, wreckage of props, etc., going *away* from a point near the mouth of No. 6 mine toward the working breast and through the underground connection into No. 8, thence out to the surface, increasing in force as it went.

IV. Immediately preceding the explosion a train of loaded cars had broken loose, dashed down the incline into No. 6 mine and were wrecked at the foot of the slope; and mixed up with the wreckage there was a live trolley wire carrying a high voltage.

A purely gas explosion would have been more localized unless the gas was widely distributed throughout the mines, and in the latter case the gas would have been ignited when the miners first went on duty early in the morning.

It therefore seems extremely probable that the runaway cars in their rapid descent stirred up volumes of dust, which was carried into the mine by their rush, and was there mixed with air and gas, and ignited by the shattered trolley wire. The explosion stirred up more dust and gas, thus gaining headway and force as it trav-

ersed No. 6 mine and reaching its culmination in No. 8, where the greatest damage was done.

Disinterested experts claim that the force and direction of the explosion can be plainly traced, and that the reason of the small damage at the mouth of No. 6 was that the explosion originated near there and had not accumulated the energy shown when it reached No. 8.

As has been so often suggested after previous explosions, there should have been an independent air-course, properly bulkheaded and shielded from the force of any explosion, but which could have been easily thrown into commission after the explosion; thus preventing the lamentable loss of life by after-damp.

What are the lessons brought out anew by this explosion?

Never trifle with gas or dust.

Test for gas every day before the working force goes on duty and also after every shot.

Install and use sprinklers in every dry coal mine, regardless of whether the inspectors demand them or not.

Never connect coal mines as was done in this case.

Appoint inspectors only after a rigid written examination as to their experience and qualifications, and have this examination made by recognized authorities.

S. H. BROCKUNIER.

Wheeling, West Virginia, December 12.

Professional Customs.

[The questions to which reference is made in these letters will be found in our issues of October 5 and 19.—Editor.]

The Editor:

Sir—While on the train today, I penned the following replies to the questions appearing in your issue of October 5:

1. A fee for a specific period, and if this period is exceeded then a pro rata charge for the excess.

2. A written contract is advisable, but an exchange of letters should be sufficient where the client is known to be honorable.

3. Yes.

4. Yes.

5. (a) Yes, except tobacco.

(b) Yes.

(c) No.

(d) It is well to keep an itemized account, for the purpose of making a final statement in case they should be called for. Anyhow, it is a good check. Incidentals may cover a multitude of doubtful expenditures.

(e) Whenever practicable take vouchers.

(f) Yes.

(g) At end of engagement unless otherwise required by the client.

6. It is better *not* to render reports during the progress of the work unless the property is so manifestly good or bad that you can safely do so, for the reason that so many elements enter into a report upon which the expenditure or non-expenditure of money depends.

7. The purchase of shares during an examination is not permissible and not afterward without the knowledge of the client, unless perchance he declined to become interested. The knowledge obtained belongs to the client.

8. It is quite legitimate to examine and take other properties in the district after the work for your client has been completed and report rendered.

9. Absolutely no objection, on the contrary, most desirable.

10. It often happens that a final opinion cannot be expressed until there has been further development.

The matter of cleaning out old drifts, in other words putting the mine in condition for examination, depends entirely upon the contract between buyer and seller. On general terms "it goes without saying" that the mine should be in condition for examination.

GEORGE W. MAYNARD.

Tucson, Arizona, November 16.

The Editor:

Sir—Upon first reading these questions I was undecided as to whether they were really written by an unexperienced man. If they were, he is considerably wiser than he cares to admit; however, they are quite interesting.

First, one correction: he could not be "competent to make the examination" unless he had previously accompanied a seasoned engineer on many trips, in which case he would have learned all that he asks.

1. Fee or salary. As he is going to the tropics the salary basis would prove the most satisfactory to his employers and fairest to himself. There is no danger of his protracting his trip to secure additional pay, whereas if on a fee he would be very likely to hurry up his work in order to get back to the States.

3. This should be interchanged with No. 2; in answer to 3, it should not be necessary to "demand" any money to cover expenses of the trip. If all the cash necessary is not freely offered, the trip should be canceled at once.

2. Having received sufficient money to cover the complete trip, the letter or telegram offering the engagement is sufficient.

4. Most decidedly, but the engineer certainly understands that these implements, etc., belong to the company after he returns and reports.

5. (a) Certainly, except possibly tobacco, and if the trip takes one where tobacco may be unreasonably dear, then I would include that also. (b) He is entitled to first-class accommodations wherever he may go, but not necessarily the best, as he should be thinking about his work, not his stomach. He should go to any expense which may be required to keep him in good health. (c) Most decidedly not; he must travel first-class in order to give the impression that his company is prosperous, in order to keep in good health, and because to do otherwise would be grafting. (d) There need be no charges to 'incidentals,' except possibly at the end of a report to cover small sums spent for street-car fares, tips, not already accounted for, etc. (e) It is necessary and best to take vouchers for any amount, say over ten dollars, which the employer cannot ascertain to be correct himself without much trouble. For instance, there is no sense in taking a voucher for fare paid from Denver to San Francisco or from San Francisco to Panama, as by one minute's use of the telephone the employer can ascertain exactly what it is. But with a fare paid from Panama to some little port in South America the case is different, and a voucher should be taken. Also, there is no reason to take vouchers for money paid for hotel bills, as these items should themselves show whether they are honest or padded. But a bill for grub bought for a trip of a few days or weeks should be turned in. (f) Yes, unless his own ignorance is the cause of his needing such information. (g) This depends on what the employer demands, once a month is certainly enough in any case, but for his own good he should know at any minute just what his cash balance is.

6. How large a fee does the inexperienced young man expect to get for his first examination? There should be enough left over from his "cash for expenses" to nearly cover this item. The company is certainly justified in demanding frequent reports; they have property which

can be attached in case of failure to pay for services rendered.

7. Yes, in case he can do so without hurting financially the people for whom he is working, and in the event that he has time to spare, neither of which is likely to be the case, before his report is rendered. After rendering his report, if it is an honest one, I consider he has a right to deal with the stock as any outsider would.

8. I wonder what he thinks "examining a mine" means. Does he think he can examine a neighboring mine by going through it with the foreman who will show him thousands of tons of fine ore blocked out, but which cannot be milled on account of a shortage of quicksilver at the mill! He won't have an instant's time to "examine" any adjoining mine.

9. There should be no objection, but instead he should do so if his stay in the district is long enough to enable him to become thoroughly familiar with the situation. If his employers suffer through the publication of the truth about the district, this is not an objection, as they cannot be conducting a legitimate business.

10. He is most certainly justified in spending all the money necessary to clean out old drifts, etc., if such work is necessary before the mine can be either condemned or accepted, provided, of course, that the object of the examination is to furnish material for the condemnation or acceptance of the property, its further working, etc. The engineer would be foolish to offer any definite conclusion if the facts obtainable were not sufficient.

CHAS. J. LYSER.

San José, Costa Rica, November 10.

Esperanto.

The Editor:

Sir—Notwithstanding the immense amount of publicity which has been given to Esperanto, the international language, I find that at this time not more than one-tenth of the people of the United States have even a vague idea of its purpose and scope, and perhaps not one in a hundred has a reasonably definite conception of it. As a sort of counter-irritant to the irresponsible criticism which is occasionally circulated by the uninformed, I have printed for free distribution a second edition of 100,000 copies of a small primer, 'Elements of Esperanto,' setting forth the grammar, word-construction, and purpose of the language, and will mail a copy to any person who requests it, sending stamp for postage. While you may not be personally interested, there are thousands of your readers to whom this movement for an international auxiliary language, which now covers every country on earth, will appeal as something more than a fad, and they will appreciate your giving publicity to this letter.

ARTHUR BAKER.

Editor 'Amerika Esperantisto.'

1239 Michigan Ave., Chicago, December 5.

MACHINES for distributing concrete have been employed in street construction work to avoid the manual labor required to distribute the material by means of wheel barrows. The bed carries an 11-ft. cubical concrete mixer, a 16-hp. gasoline engine of the automobile type, and a frame upon which rides a hopper for delivering the material of each batch into the mixer. Beyond the frame projects a 25-ft. boom carrying a track upon which rides a dumping bucket. It is supported by guys, while at the middle is a cross-frame having small wheels which rest on the graded surface of the street. The boom is pivoted at its inner end, and has a horizontal swing of 170°, so as to cover the width of a 50-ft. street. The machine in working order weighs 15,000 pounds.

Japanese Mining Laws.

There are, generally speaking, three kinds of right of ownership to mines, these being: (1) The system of accession, that is to say, the system of ownership by the land proprietor; (2) domainal system, that is to say, the system of State ownership; (3) the system of concession, that is to say, the system of giving concession by the State to the applicant. Japan never adopted the first system; it adhered to the system of State ownership from olden times till quite recently; and when the privilege of working a mine was granted, this concession was regarded as a favor by the Government, given for a certain limited period in consideration of the payment of a royalty. This period, as mentioned in the Mining Regulations issued in 1873, was 15 years. In 1890 the mining regulations were amended; when these new regulations went into effect two years later, the concession system, distinctly establishing the right of permanent working, was inaugurated, and thus the sound development of the mining industry was safe-guarded.

Minerals recognized in the mining regulations are as follows: Ores of gold (excluding alluvial gold), silver, copper, lead, tin (excluding stream tin), antimony, quicksilver, zinc, iron (excluding iron sand), iron pyrites, manganese, arsenic, graphite, coal, petroleum, sulphur, bismuth, chromite, phosphorus, lignite, and asphalt. The last five were added to the list in 1900.

Formerly an alien was disqualified from working a mine and was further prevented from becoming a member of a mining company, so that the right of working mines was reserved exclusively for Japanese subjects. In consequence of the amendment of the mining regulations in 1900 a company, organized by Japanese or aliens, or by both combined, is allowed to work mines, provided such a company is under Japanese laws. This amendment encouraging the formation of mining companies by aliens, has proved a means of stimulating the development of the industry. Contrary to the usage in many Western countries, Japanese law does not recognize the right of priority of discovery. The right of prospecting or of mining is granted to the one who first applies for it whether he discovered the minerals or not. The reason for this is that the fact of an alleged discovery is exceedingly difficult to verify, and Japan considers that accidental discovery does not deserve any special privilege. The right of prospecting carries with it the great privilege that no other person is allowed to apply for the privilege of prospecting for the same minerals in the same area.

The non-recognition of the right of priority of the owner of the land in which a discovery is made is derived from a fundamental principle of Japanese legislation, and must be regarded as a highly reasonable provision. The term for prospecting is limited to one year, to be extended to another year when such extension is regarded proper and necessary. In contrast to this limitation in the period of prospecting, no such limit is enforced in regard to mining. Further, though the right of prospecting cannot be transferred to a third person, or be used as an object of hypothecation, the right of mining can be sold, bought, assigned, or be made an object of hypothecation.

The fact that the concession for working a mine was at first limited to the space of only 15 years, and that this concession was forbidden from being made use of as an object of hypothecation, seriously interfered with the proper development of the industry. The subsequent amendment of the regulations has removed those two grave defects, and today concessionaires and capitalists are enabled to invest large sums in the exploitation of mines.—*Iron & Coal Trades Review.*

Mining Under Adverse Circumstances.

Written for the MINING AND SCIENTIFIC PRESS
By E. McCORMICK.

The subject of this brief article pertains to one of the producing mines of the Arizona Copper Co., an organization employing some 2,000 men in the mining and treatment of copper ores in the Greenlee Copper Mountain mining district of Arizona.

The 225 mineral claims of this company cover 4,650 acres, most of the locations being patented. They are divided into four groups, namely: Morenci, Metcalf, Garfield, and Coronado, all situated north and west of Clifton. The company operates two lines of railroad, one a 7-mile narrow gauge from Clifton to Metcalf, known as the Coronado, and the other a standard line of 107 miles between Clifton and Hachita, New Mexico, known as the Arizona & New Mexico. The former is chiefly for the transportation of ores and concentrates to the smelter at Clifton; the latter puts the various towns of the district in close touch with the outside world.

Ore is taken from the different mines to storage bins on the Coronado railroad, thence to the reduction plant at Clifton, the object of this article being to present an idea of what difficulties have had to be overcome at one of the units before this ore reached a marketable point. The property in question is known as the Coronado. This group comprises 50 claims and is situated $2\frac{1}{2}$ miles southwest of Metcalf at an elevation of 5,820 ft., the elevation of Metcalf being 4,415 and of Clifton 3,465 feet.

The leading mines of this group are known as the Matilda, Crown Reef, Horseshoe, and Boulder, the ore-bodies being of immense size but low-grade, running from 3 to 6% copper. They are chiefly silicious sulphides and occur between granite and porphyry with diabase intrusions in the form of vertical lenses.

All ore is hoisted through the Matilda double-compartment shaft from the various workings. On reaching the surface it is trammed to ore-bins 150 ft. distant. From this point it is taken over a circuitous route around the hills $1\frac{1}{2}$ miles to the top of an incline known as Coronado Junction, by a Porter locomotive hauling ten 2-ton ore cars over a track of 20-in. gauge. At this point the cars are sent down to Metcalf Junction by a gravity tram (see Fig. 1 and 2) in trips of two cars. The length of the tram is 3,300 ft. with a drop of 1,200 ft., some 200 tons being transported in 8 hours. On reaching Metcalf Junction these cars are again trammed to another ore-bin, 200 ft. away, the empties being returned to be picked up by the next trip of loaded cars coming down. This ore is now removed to another set of bins at Metcalf, one mile distant, by another Porter locomotive and train of cars, and finally goes to Clifton over the narrow-gauge.

All up freight, such as timbers and supplies, is handled in the same way; that is, it must come from Clifton and be transferred at Metcalf, loaded into junction cars and be again transferred to the up-cars on the gravity incline, and, on reaching Coronado Junction, it is hauled to its proper destination. Considering the number of times ore must be handled, the relative cost per ton is not high, as the following data illustrate:

2 locomotive engineers.....	@ \$3.25	\$6.50
4 brakemen.....	@ 2.50	10.00
1 foreman.....		3.25
4 laborers.....	@ 2.50	10.00
1 lever man.....		3.75
Mule expense, feed, and attendance.....		2.50
		\$36.00

Or 18 cents per ton as figured on a daily production of 200 tons. Ninety-nine per cent of the force consists of Mexicans, they having been found to give a relatively high degree of efficiency, as the property presents no difficulties requiring a more intelligent class of labor.

Improvements in the Homestake Mill.

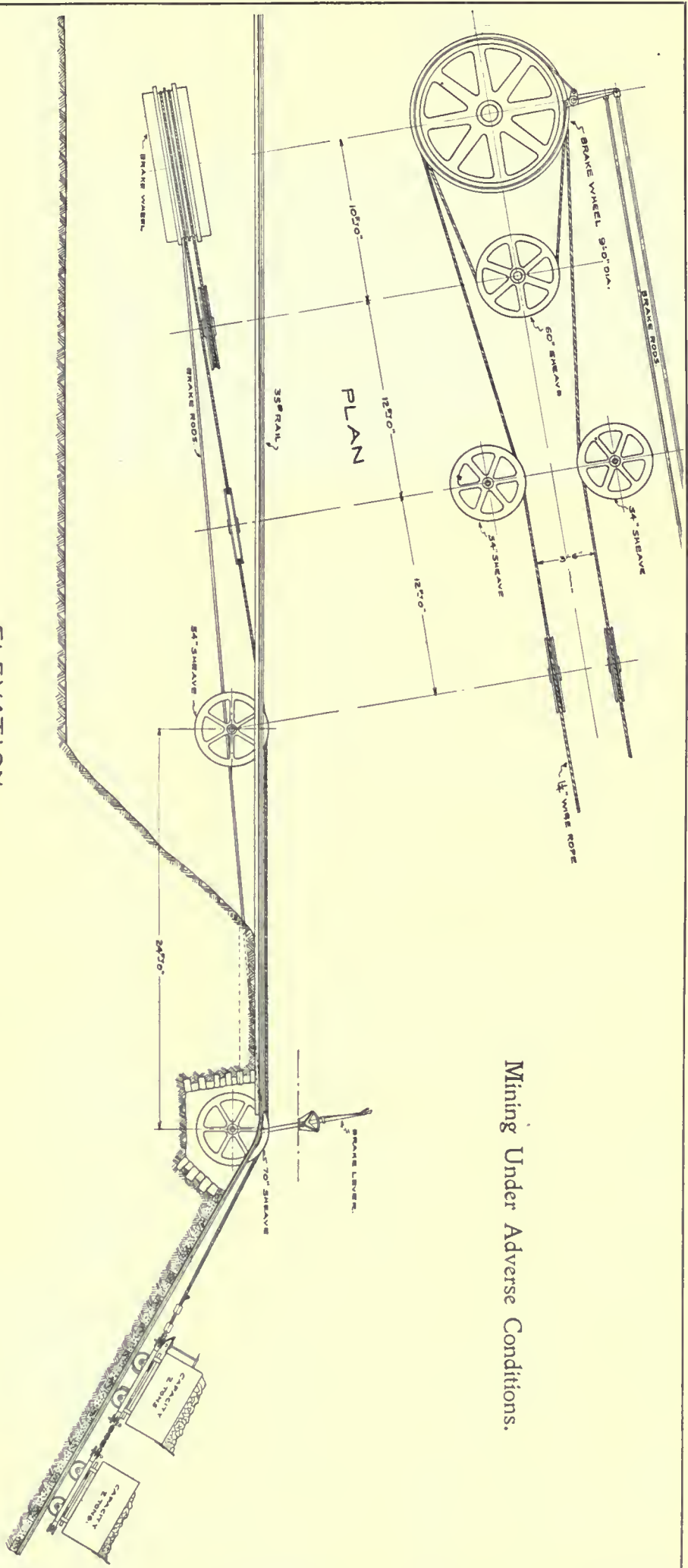
Now that the Homestake mine is again producing its normal mix of ore after the difficulties caused by the fire, the slime plant of this company has reached a point where the showing will approach the work of the future, and C. W. Merrill, superintendent of the mill, designer of the plant, and inventor of the special process that makes it unique, has made public figures relating to the cost and operation. These figures are based on actual operation of the plant for the month of November, during which period 21 presses were completed and running. Today 22 of the 24 filter-presses are in operation and, with the addition of the two others, a still further change will be made in the cost and recovery figures.

During the month of November the plant treated 39,468 tons of slime for a recovery of 88%, by charge and residue assays, and 91% by bullion; while the total costs were approximately 32 cents per ton. The average value of the slime treated was 90 cents. The cyanide decomposition was 0.37 lb. for the first 10 days, 0.33 for the second 10, and 0.325 for the last 10 days. The zinc consumption was 0.2 lb. zinc-dust per ton of slime, while the lime consumption was $4\frac{1}{2}$ lb. per ton. During the last 10 days of the month, which may be taken as a fair sample of the work being accomplished at present in the big plant, an average of 1435 tons of slime was treated per day for a recovery of 89%. The full capacity of the plant is placed at 1600 tons every 24 hours on the slime from the ore mixture now being milled.

One of the most interesting features of the work is the low consumption of power. This was less than one-twentieth of a kilowatt per ton of slime per day, and according to Mr. Merrill this would be reduced to a merely nominal figure were it not for the necessity of compressing a large volume of air in order to oxidize the reducing chemicals in the Homestake ore. This necessity calls for at least 70% of the power used in the treatment of the slime. The explanation of the small amount of power used is the fact that there is no agitation of pulp, and to the further possibility of using a very small bulk of solution; namely, 1 to 1 or less being all that is leached through the slime-cakes.

A thorough test has been made with different ores. During the period of the memorable fire last summer, or rather during that period when the mills were able to resume crushing after a month's idleness, the Homestake was obliged to secure its ore from the open-cut, surface ore being used. While this ore was of lower grade and slower of treatment than that taken from the lower levels, as today, it yielded a slightly higher recovery (up to 93%) as was to be expected from ore containing practically no sulphides.

The slime-plant is today approaching its normal working basis, most of the construction work having been completed and the force of workmen being gradually reduced to an operative basis. The automatic sluicing device, which is one of the important features, has proved entirely successful in this the largest slime plant in the world. The presses hold 26 tons each, while the largest hand-removal presses operated elsewhere have a capacity of but 6 tons each. Mr. Merrill expects that the recovery will shortly be brought up to 90%, or slightly better, and the cost reduced materially, just as the costs per ton at the cyanide sand-plants have been reduced, until today they are less than 25 cents per ton of material treated, as compared with nearly double that figure during the early operations of these plants. The addition of this plant has brought the recovery from Homestake ore to 93% at a total milling cost for crushing, amalgamating, and cyaniding of approximately 50 cents per ton.



Mining Under Adverse Conditions.



GENERAL PLAN OF INCLINE.

FIGURE 2.

Cobalt.

Written for the MINING AND SCIENTIFIC PRESS
By FRANK C. LORING.

The Cobalt silver mining district is situated about 300 miles north of Toronto, Canada, and 103 miles north of



Cobalt in Winter.

North Bay, which station is situated on the Grand Trunk and Canadian Pacific railways, thereby connecting Cobalt with Toronto, Ottawa, Montreal, and elsewhere. The Temiskaming & Northern Ontario Ry., constructed by the Ontario Government with the original object of developing the farming and timber regions to the north, runs from North Bay through Cobalt and thence northerly to connect with the Grand Trunk Pacific railroad near Lake Abitibi. The train leaving Toronto at 9 o'clock in the evening reaches Cobalt at 8:45 the following morning.

Silver ore was first discovered at Cobalt in 1903 by men engaged in the construction of the railroad. The phenomenal richness of the ore at once attracted attention, resulting in new discoveries and rapid extension of the ore-bearing area, at present extending 8 to 10 miles easterly and westerly and 4 to 5 miles northerly and southerly. Not all of this area contains mines, but all the mines are within this limit.

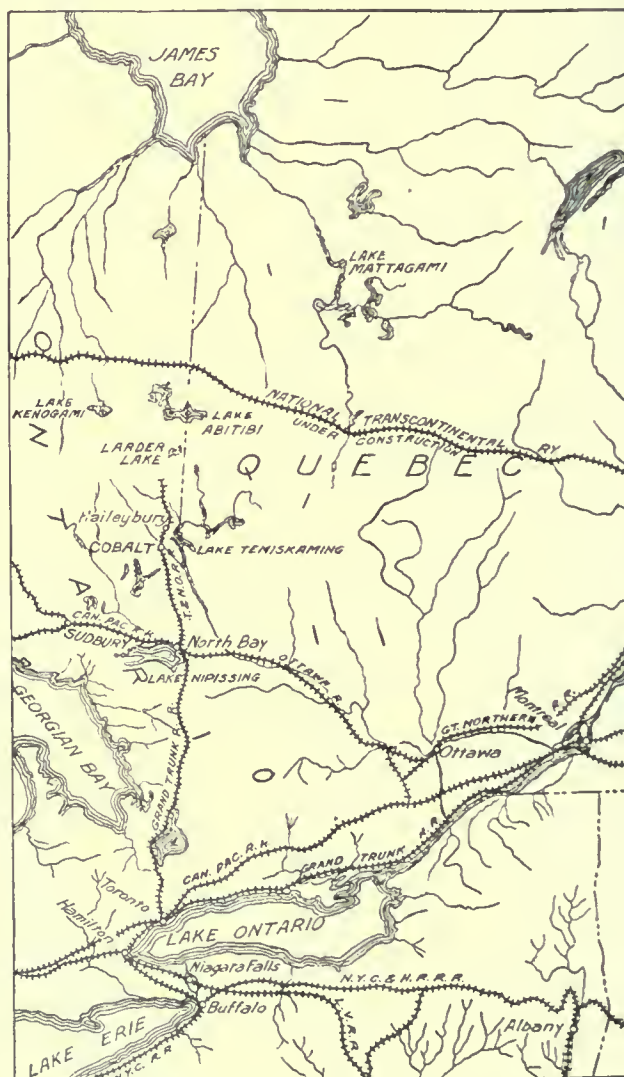
The geology of the Cobalt district, as well as all of that portion of Canada is exceedingly complex, extending in age from the igneous complex of greenstones, porphyries, and other rocks of the Keewatin series, through the metamorphosed sedimentaries (Huronian slate and conglomerate) and diabase intrusions of various ages. Limestone also is found in this region.

Veins occur in all the geological formations mentioned. These veins, especially in the Huronian, are exceedingly numerous, and usually of slight persistence both as to depth and lateral extent. There are, however, numerous instances of well-defined and extensive faults, showing strong fissures and a wide zone of faulting. In these fault-zones the rich ore is a minor incident that may recur many times at various depths. The ore mined has been so remarkably rich, and the mining has been so easy, that until recently but slight effort has been made to explore these veins to any considerable depth. The deepest development in the district is about 400 ft., and in most cases ore has been mined to an extreme depth of less than 100 ft. Until the present year mining has been conducted in an extravagant and reckless manner, only the richest ore being saved and marketed; the remainder, amounting in quantity to many times the amount sold, has been thrown upon the dumps.

The ore consists of compounds of cobalt, nickel, and silver, with arsenic, iron, sulphur, and other metals to a less degree, as well as of native silver. This mineral out-

put ranges in value from native silver and 8,000 oz. silver per ton in silver-cobalt-nickel ore in carload lots, and as high as 15% cobalt, 10% nickel, and 50% arsenic, down to a few ounces of silver per ton. Calcite usually accompanies the silver. The rich ore streaks are from the thickness of a knife-blade to as much as two feet. Accompanying these rich streaks, and especially in the fault-fissures, the adjoining rock carries native silver, sometimes for a width of six feet or even more. Continuous ore-shoots extending as far as 800 ft. longitudinally, and to 200 ft. in depth, are found. Usually, however, the occurrence of ore is irregular, and of slight extent. It has been so easy to extract rich ore cheaply near the surface that but few data have been obtained as to the continuity of the ore in depth. During the past year, however, development on the La Rose, Nipissing, Kerr Lake, McKinley-Darragh, Nova Scotia, Foster, Temiskaming, and other properties proves that ore may occur at various depths, and possibly to great depth. Up to the beginning of the present year, about 12,000,000 oz. silver, valued

at about \$7,500,000, have been sold. Little has been received for cobalt, nickel, or arsenic, consequently, no data can be obtained as to the value of these metals pro-



Map Showing Position of Cobalt and New Districts in Ontario.

duced. During 1907, up to October 1, 10,300 tons of ore have been sold, for which possibly \$6,000,000 has been received, almost entirely for silver. The district is now

shipping approximately 1,000,000 oz. silver per month, as well as large quantities of cobalt, for which little is paid. The present market for this ore is in the United States, also at Copper Cliff (Ontario), and in Europe (to a small extent for ore high in cobalt, low in silver). Transportation and treatment charges are from \$15 to \$25 per ton, with deductions of from 6 to 7 % of the assay-value of the silver. One smelter pays \$20 per ton for ore carrying 8 % cobalt. If ore is sold solely for cobalt 35 to 50c. is paid per lb. of cobalt, according to the percentage, with no allowance for silver. Smelters are being erected and these excessive charges and deductions may cease.

The value of the ore shipped ranges from 100 oz. silver per ton to 8,000 oz. in carload lots. Owing to the small profit in marketing ore of low grade, but a small part of it is marketed. In the process of mining, low-grade ore amounting to many times the number of tons of high-grade ore sold has been accumulated. This ore can be treated by concentration. Two concentrating plants are now in operation, five are in process of construction, and undoubtedly more will be built. When these are ready, the production of the district will be largely increased. There are about 20 producing mines, about as many promising prospects, and a great number of mining claims of problematical value.

During the past year, the principal mines have been equipped with steam plants for furnishing power for drilling and hoisting, substantial buildings have been erected, men of experience have been employed as managers, extensive prospecting and development are in progress. There is much evidence to show that a fair proportion of the veins are lasting, and that in some veins ore will be found at considerable depth. In a few cases blind lodes have been discovered, thereby increasing the range of possibility of successful exploration.

ORE ROASTING.—Some recent experiences in connection with ore roasting at the Great Boulder Perseverance mine, at Kalgoorlie, are of special interest. In operating the duplex roasters it was noticed that as the amount of feed was increased beyond certain limits and it became necessary to fire harder in the front fire-boxes, the ore in the hearth-area between these boxes became overheated, causing it to swell in degree varying with the schistose nature of the ore; this gave rise to what is known as 'balling,' the particles of ore cohering lightly in globular form, and enclosing some of the particles of pyrite. When the ore assumes this condition the normal possibilities of exposing the pyrite to oxidation during the subsequent progression toward the discharge-chutes are much reduced, and an indifferent roast results. To obviate this overheating and minimize the clinkering of ore round the throats of the fire-boxes, the plan was suggested of accelerating the speed of the three sets of rabblers, each set situated respectively between, forward of, and behind the front fire-boxes, and so passing the ore quickly through this zone of excessive heat. The normal speed of these rabblers had been $4\frac{1}{2}$ rev. per min., and this was increased to 9 rev. per min., while the speed of the remaining rabblers was maintained at $4\frac{1}{2}$ rev. per min. As a consequence the depth of ore-bed within the area of accelerated rabbling was much reduced, and the experience of the past five months has demonstrated that 'balling' is now prevented, exposure to oxidation is facilitated, no ore is thrown onto the bridges of the fire-boxes, and clinkering is greatly minimized.—*Journal of the Chamber of Mines of Western Australia.*

The first mining and smelting of lead in what is now the United States was near Falling creek, Va., to supply the local demand for bullets and shot.

Decisions Relating to Mining.

Specially reported for the MINING AND SCIENTIFIC PRESS.

Where a mine-owner failed to comply with the statute requiring him to guard his employees from injuries by reason of dust, bad air, explosives, etc., he was not permitted to plead contributory negligence or assumption of risk in an action by a miner for an injury caused by failure to comply with the statute.

Bolen-Darnall Co. v. Williams (Ind. Terr.), 104 Southwest, 867, Sept. '07.

The foreman of a mine whose duties were confined to the underground part of the mine was not the superintendent of the colliery within the meaning of the Pennsylvania statute for the purpose of giving notice to the mine inspector of the district.

Corgan v. Lee Coal Co. (Pa.), 67 Atl. 655, May, '07.

A coal miner with eleven years' experience, and who had worked for eighteen months in a particular mine was held competent to testify as to the sufficiency of a sprinkling machine used by the mine owner to keep down explosive dust.

Bolen-Darnall Co. v. Williams (Ind. Terr.), 104 Southwest 867, Sept. '07.

A mule, driven by a miner in hauling cars of coal out of a mine, took fright at an object properly in the mine, broke loose from the car and ran away. The pit-boss represented to the driver that the mule was only frightened; that ordinarily he was gentle and could again be worked and induced the driver to take it back into the mine, hitch it up, and finish the work; the miner did so, under protest, and relying upon the opinion of the pit-boss as to the gentleness and safety of the undertaking. He continued driving the mule, hauling out a number of loaded cars, when later in the day the animal again became frightened at the same object, by reason of which the driver was thrown under the car and received serious injury. It was held that the miner assumed the risk with knowledge of the danger, and could not recover.

Milby Co. v. Balla (Ind. Terr.), 104 Southwest 860 Sept. '07.

The rule that the master is required to use ordinary care to provide a reasonably safe place and appliances for work, and the servant to exercise like care in using the place and appliances, and, if he becomes aware of any defects therein not known by the master and continues and is injured he cannot recover, applies to mine owners and miners, as well as to other relations of master and servant.

Milby Co. v. Balla (Ind. Terr.), 104 Southwest 860 Sept. '07.

The burden of making well reservations was said to be on the lessee or his assignee where the lease provided for the construction of seven wells on a seventy-acre tract of land, and that the lessor could not arbitrarily set off 20 acres for two producing wells, and quiet his title to the remaining tract after the expiration of the time for the construction of all the wells. The lessor could only demand that the lessee make the reservation within a reasonable time, and on his failure to do so could maintain an action for such apportionment by the court.

Pittinger v. Ramage (Ind.), 82 Northeast, 478, Nov., '07.

The validity of both placer and lode locations depends on the discovery of mineral within the limits of a mining claim.

New England Oil Co. v. Congdon (Cal.), 92 Pac. 180, Oct., '07.

It is not necessary that the discovery of mineral should precede the location of a mining claim in order to sustain the location.

New England Oil Co. v. Congdon (Cal.), 92 Pac. 180, Oct., '07.

Prolonging the Life of Mine-Timbers.

By JOHN W. NELSON.

*In 1906 the Forest Service, in co-operation with the Philadelphia & Reading Coal & Iron Co., made a series of experiments to determine the best methods of prolonging the life of mine-timber. The results of the study are given herewith.

Forty-five per cent of mine-timber is destroyed by decay, while breakage, wear, and insects together destroy the remainder. (See Fig. 1.) It is decay and its prevention in which the Forest Service is more especially interested. By direct experiment it is being shown that both oils and chemical salts, and the precaution of peeling and seasoning, prolong the life of the timber. The point of first practical importance, then, is: What method of handling and what preservative treatment will give the greatest service at the least expense?

Decay or rot is produced solely by certain organisms called bacteria and fungi. Germs or spores which produce decay may gain access to the timber at any time before or after it is cut, though for the most part the disease is contracted in the mines from decaying timber near-by. In untreated timber, rough surfaces of bark and wood furnish a foothold for the spores, which subsequently germinate and attack the tissues. Spores may also enter timber only superficially treated through checks, cracks, or nail wounds.

For a fungus to exist it must have a

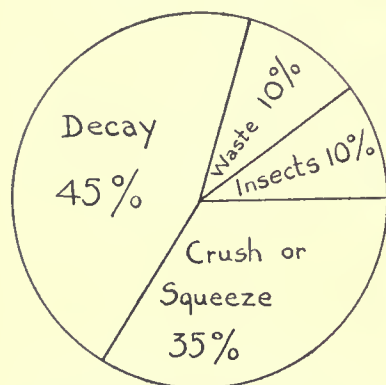


FIG. 1. Diagram showing relative importance of the causes of destruction of mine timbers.

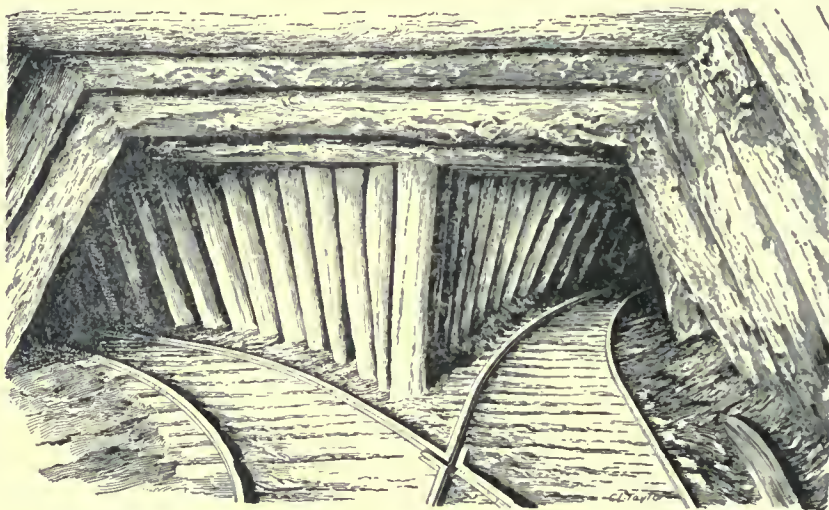


FIG. 2. View in a Pennsylvania coal mine, showing the great amount of timber that is used. (Drawn from a photograph.)

definite amount of air and water, food and heat. If mining conditions were such that the timber would be kept always wet or always dry, it would never decay. It is the alternating wet and dry conditions or continuous dampness that produce rot.

Ventilation is a large factor in the life of timber. Poorly ventilated gangways and air-passages, with a fair degree of moisture and a fairly high temperature, are favorable to fungus growth, and hence to rapid decay.

A large percentage of the gangway timber used in anthracite mines is broken by the 'squeeze' and 'crush' of coal and rock. Where timber is certain to be broken in a few days or weeks, expensive preservative treatment would not be economical. However, in many situations the timber is broken only after it has been greatly weakened by decay, and for these cases an inexpensive form of treatment may properly be considered.

Cross-ties in main haulage ways are constantly worn by the rails and by the feet of mules. Wooden rollers, drum laggings, etc., have to be replaced when worn by the contact of ropes and cables. A preservative treatment

is obviously not suitable for timber subjected to this sort of wear.

The important part which insects play in the destruction of timbers is rarely realized. They are for the most part brought into the mines with the timber. Regular and thorough inspection and the rigid condemnation of insect-infested timber would therefore greatly reduce the loss from this source. Insects bore into sound wood and greatly weaken it and, moreover, leave holes or galleries which encourage the entrance of wood-destroying fungi. A good preservative treatment will protect the timber from insect attack, as well as prevent decay. If the bark is removed from timber soon after it is cut, it will not be attacked by wood-boring insects until the wood becomes old and dry, after which it may be attacked by 'powder post' and other borers.

In the handling of timber for its many uses in the mines there is some unnecessary waste. Though decay or a fracture is often confined to but one part of a set, the entire set is rendered useless. Therefore if it is possible to preserve the threatened part, the whole prop or set may be saved. Again, in certain situations the sizes of timbers may often be materially reduced provided they are kept sound. Under present conditions the timber is often large enough to do its work after decay has progressed to a considerable depth. Instead of off-

setting this decay with sizes larger than necessary, smaller treated timbers may be used with economy.

The utilization of waste timber has been carefully investigated. Short sections of broken and partially decayed round timber have been split into lagging with some success. Worn-out and broken planks, sills, rollers, etc., have been profitably disposed of to railroad companies as fuel wood for locomotives with the additional benefit of cleaning up the collieries. Worn-out drum lagging and short ends of sound gangway timber, formerly regarded as useless, have been sawed into short mine plank, car lumber, pulley bearers, and slab plank. Rough slabs from the mills have been split into lagging and the refuse of the mill consumed as fuel.

Sets of round gangway timber of 13 in. diam. were chosen as a basis for the experimental work. These sets, which are used for supporting the main haulage ways, consist of two legs (9 and 10 ft. long) and a collar (from 6 to 7 ft. long). They are usually placed in gangways at intervals of 5 ft. through miles of passages. Each set represents about 26 cu. ft. of timber, and one gangway frequently contains 1,000 sets. Ten gangways to a colliery is not an unusual number; and since the average

*Abstracted from Circular 717, Forest Service, U. S. Department of Agriculture.

life of the timber in these gangways is hardly above two years, the consumption of timber in anthracite operations is vast (Fig. 2).

It was early realized by the Forest Service that a successful preservative treatment would effect great saving in the use of this gangway timber, and the chief object of the experimental work was to learn to what extent gangway timber would be benefited by peeling, by seasoning or drying out, and by treating with a wood preservative. The comparative value of different kinds of wood for gangway timber was also considered. Pennsylvania pitch pine and Southern loblolly pine were the

the weight of the water evaporated. The time of the year greatly favored rapid seasoning. The short lengths into which the timber was sawed gave a large drying surface in proportion to volume, and longer sticks would season more slowly. (Fig. 3.) Table 1 gives a synopsis of this test:

TABLE 1.		%
Loss of green weight by peeling		8.1
Loss of green weight by seasoning.....		35.1
Peeling and seasoning		43.2

If a mining company handles its own timber from the woods to the mines, the saving in freight made possible by peeling and seasoning can readily be estimated. Labor is the principal factor in the cost of peeling, while the cost of seasoning must be represented by the loss of interest on the capital invested in the timber during the seasoning period. However, these additional items of expense are more than offset by a maximum reduction in freight of from 30 to 40% and by the far better condition of the timber with regard to both its life at the mines and the readiness with which it will take preservative treatment. The peeling of timber at the mines has been unsatisfactory and expensive, because of the limited amount of yard room and the accumulation of bark. The following considerations favor peeling in the woods: (1) The saving in the cost of freight due to peeling and seasoning; (2) the saving of yard room at the mines; and (3) the prevention of fungous

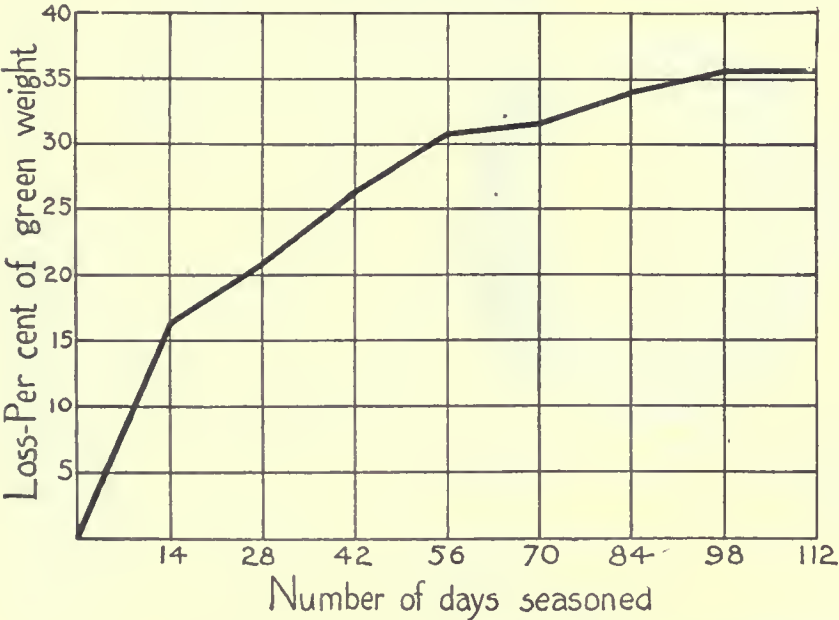


FIG. 3. Diagram showing percentage of loss of green weight by seasoning.

principal experimental timbers, since these species furnished the bulk of the round timber used in the mines of the company. Red oak and chestnut were tested as species suitable for planting in the anthracite region of Pennsylvania.

Experiments have shown that peeled timber is superior in durability to unpeeled timber. The space between the bark and the wood especially favors the development of wood-destroying fungi and is a breeding place for many forms of insect life. When, after placement in the mines, the bark begins to flake off, the timber has already begun to decay. The cost of peeling timber before it goes into the mine ranges from 20 to 50c. per ton of wood, according to local conditions and the kind of timber.

Seasoning or drying gives mining timber greater strength and durability. A stick of wet timber has only about one-half the strength of a similar stick absolutely dry. Though it is not practicable for mining companies to hold their timber until it is absolutely air-dry, peeled timber will dry sufficiently in a few months to gain in both strength and durability. From two to four months is necessary for proper seasoning.

To learn the possible loss in weight in round gangway timber, due to peeling and seasoning, a test was conducted at one of the collieries of the company. Representative sticks of Southern loblolly pine, averaging from 11 to 13 in. diam. and from 9 to 10 ft. long, were chosen. This timber was weighed immediately before and after peeling, to determine the weight of the bark. It was then weighed every two weeks until seasoned, to learn

disease and insect attack by early peeling.

Peeling and seasoning mine timber unquestionably increase its durability. However, in order to prolong its life to the fullest extent, a preservative treatment is necessary. (Fig. 4.)

Impregnated wood resists decay because the preserva-

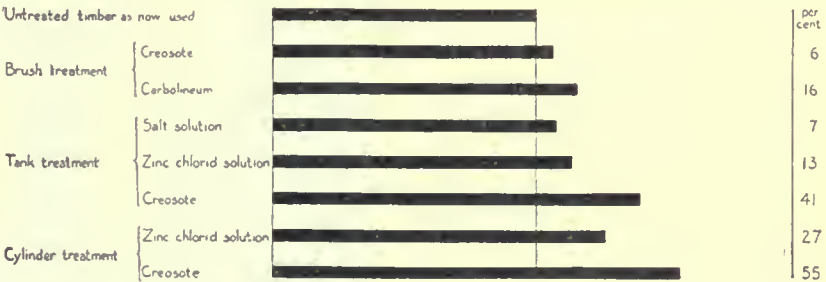


FIG. 4.

tive is antiseptic and excludes the moisture necessary for fungus growth. Timber used in the mines was treated with a variety of preservatives under several methods of application. Both green and seasoned timbers were treated to determine both the relative value of the treatments and the best method of handling preparatory to treatment. If treated at all, the timber must be peeled. Table 2 shows: (1) The method of treatment; (2) the preservative applied; (3) the cost of the preservative; (4) the cost of the treatment, both for an average set of gangway timber and per cubic foot.

Brush treatments with both creosote and carbolineum were applied in two coats to the Pennsylvania and Southern pines. A large flat brush and a kettle of the hot preservative are all that is required for this treatment. A small amount of the preserving fluid suffices, but the cost

TABLE 2.				
METHOD.	Preservative.		Cost of treatment.	
	Kind.	Cost.	Per set (25.8 cu. ft.)	Per cu. ft.
Brush	Creosote (dead oil of coal tar).....	\$0.03 per gal.	\$0.40	\$0.015
	Carbolineum	0.70 per gal.	1.15	0.045
Open tank without pressure.	Salt solution, magnesium chloride, 15%.....	0.01 per lb.	0.50	0.02
	Zinc chloride solution, 6%.....	0.04 per lb.	0.90	0.035
	Creosote	0.03 per gal.	2.85	0.11
	Creosote	0.03 per gal.	2.85	0.11
Cylinder with pressure.	Zinc chloride solution, 6%.....	0.04 per lb.	1.90	0.075
	Creosote	0.03 per gal.	3.85	0.15

of application in proportion to the results obtained is considerable. For small individual operators who can not

was briefly as follows: Green, partially seasoned, and thoroughly seasoned timber was lowered into the tank and immersed in creosote, or in a zinc chloride or salt solution, at a temperature of from 90° to 120° F. The temperature of the creosote was raised by the coils to from 212° to 220°, and that of the zinc chloride or the salt solution to about 212°. In no case, however, was the temperature allowed to go above 240° for fear of injuring the fibre of the timber and so decreasing its strength. When this hot bath was over the steam was turned off, and the timber was allowed to stand until the liquid cooled to a temperature of from 170° to 100° F. The periods of heat and of cooling were varied for each kind

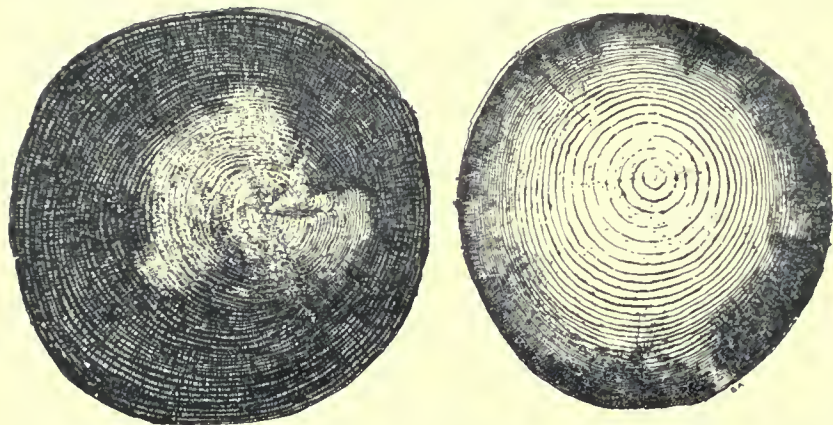


FIG. 5. Comparative penetration in seasoned and green loblolly pine. Both sticks were given the same treatment. The seasoned piece has practically full penetration. (Drawn from a photograph.)

afford the cost of a large plant, brush treatments are feasible and economical.

The disadvantages of brush treatments are:

- (1) The difficulty of completely covering the timber and filling all checks and cracks.
- (2) The slight penetration secured. The subsequent checking or opening of the timber may often allow disease to pass through the shallow exterior band into the untreated interior wood.

Pitch pine and loblolly pine have been most successfully treated with both creosote (dead oil of coal tar) and a 6% solution of zinc chloride by the open-tank process.

The experimental open tank was, for the most part, constructed from old material already in the possession of the company. A section of an old boiler, 34 in. diam. and 13 ft. long, was set vertically in the ground to a depth of 5 ft. This tank had a double bottom, separated by a space of 1 ft. Between the two bottoms a coil of 1-in. pipe 20 ft. long, carrying a steam pressure of 110 lb. per sq. in., furnished the heating surface necessary to give the preservative fluid a maximum temperature of 240° F. This coil was connected by a 1-in. pipe to a 10-in. steam main 75 ft. distant. The timbers, which were placed vertically in the tank, were immersed by attaching a circular weight to their lower ends. The timbers were lowered into and hoisted from a tank by means of a small hand derrick with a swinging arm.

The open-tank treatment as given in this experiment

of timber and for each stage of its seasoning. The time required for the cooling operation, which depended largely upon the temperature of the atmosphere, was usually from 3 to 12 hours. For the whole treatment the time varied from 6 to 20 hours.

The theory of the open-tank process may be given in a few words. The heat of the preservative expands and expels a portion of the air and water contained in the cellular and inter-cellular spaces of the wood tissue, and as the preservative cools there is a contraction and condensation of the air and water that remain. To destroy the partial vacuum thus formed, the liquid is forced by atmospheric pressure into the cellular and intercellular spaces, a process aided, of course, by capillary attraction. In point of fact, therefore, the hot bath merely prepares the wood for absorb-

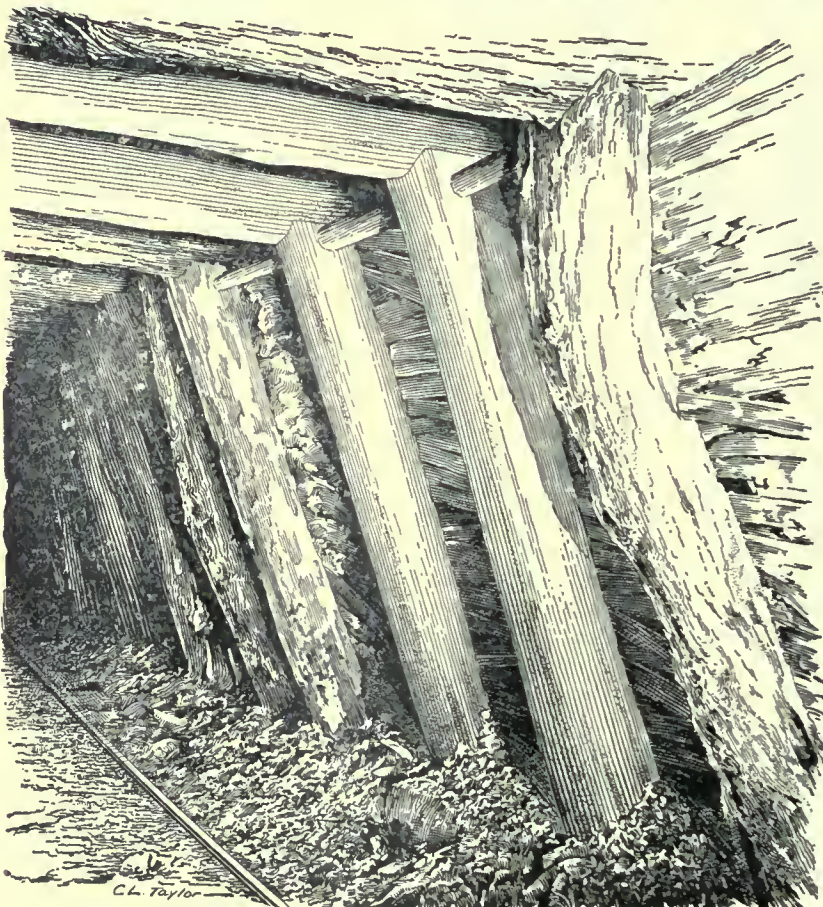


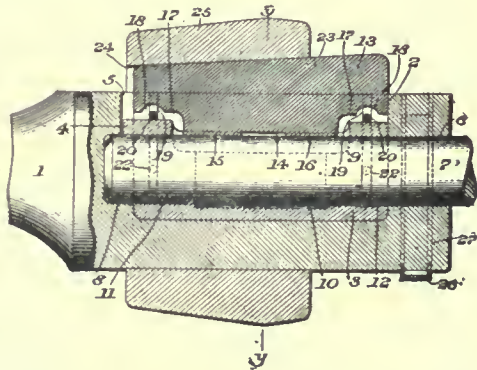
FIG. 6.

ing the preservative, and the actual impregnation follows as the preservative cools. The ease and effectiveness with which timber can be treated depend upon the kind of wood and its degree of dryness.

MINING AND METALLURGICAL PATENTS.

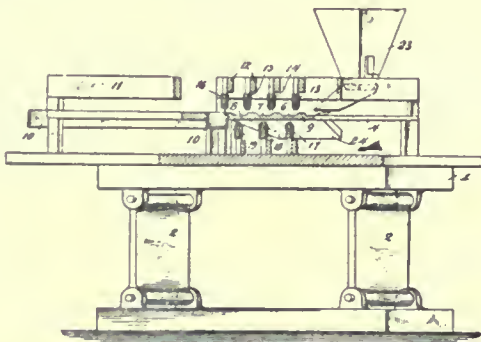
Specially Reported for the MINING AND SCIENTIFIC PRESS.

SELF-TIGHTENING ROCK-DRILL CHUCK.—No. 871,972; James A. Thompson, Edwin M. Mackie, and Percival F. Doyle, Chicago, Illinois.



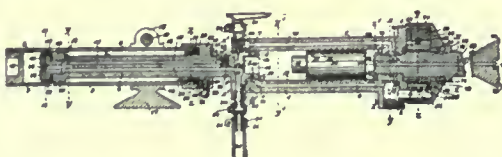
In a self-tightening rock-drill chuck, the combination of a chuck body having an apertured face, a bushing therefor having an inner relieved portion intermediate its ends, and a slot opposite said relieved portion, means for resiliently securing said bushing in said aperture, a chuck key engaging said slot and aperture and having an inclined top, a device engaging said chuck body and chuck key to maintain the parts in assembled condition, and means for limiting the forward movement of said device when the chuck key is removed.

MAGNETIC SEPARATOR.—No. 871,365; Alfred Schwarz, New York, New York.



In a magnetic separator the combination of a table having a riffle board supported thereon, electro-magnets above and having their polar faces in proximity to said board, said magnets being disposed in independent rows, means to feed the material to be separated in proximity to the first row of magnets, means to energize and de-energize said rows of magnets successively to separate a given mass of magnetic particles from the non-magnetic, and to transport the former across the table by alternately attracting and releasing the same so as to fall within the fields of successive rows of magnets, rows of electro-magnets below, and having their polar faces in proximity to the under side of said board, and means to energize and de-energize said magnets alternately above and below the riffle board.

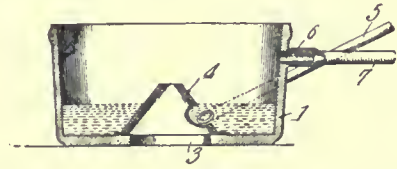
ROCK-DRILLING MACHINE OR ENGINE.—No. 872,418; Henry Hellman and Lewis C. Bayles, Johannesburg, Transvaal.



In a drilling or boring machine or engine, a power cylinder containing percussive apparatus and provided with a rear extension, a feed-cylinder into which the rear extension

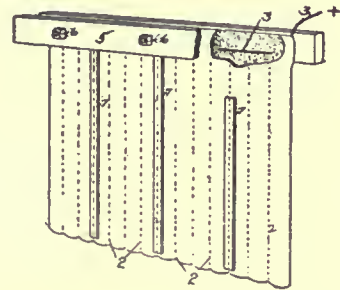
is engaged, a piston carried by said extension, a port for supplying air to the apparatus, a port for supplying water under pressure to the rear extension, and a valve for connecting either of said ports as desired to said extension.

ORE-CONCENTRATOR.—No. 872,555; John R. Capps, Middletown, California.



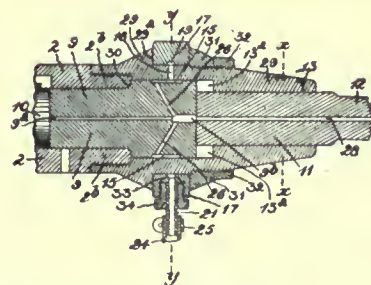
In a concentrator of the character described the combination with a stationary bowl having a central orifice in the bottom thereof and a hollow frusto-conical extension upon the bottom of the bowl and surrounding the orifice, said extension being fixed within the bowl and constituting an outlet for tailing; of a tangentially disposed pipe inclined downward toward the bottom of the bowl and opening into the bowl, said pipe being disposed to direct fluid under a head into the bowl to produce a whirling action, an outlet pipe extending from the bowl adjacent the top thereof, a flexible hose extending from said pipe, and discharging means connected to the bowl adjacent the bottom thereof, the upper end of the frusto-conical extension being located in a horizontal plane extending below the outlet pipe.

ELECTRODE.—No. 872,878; Robert J. Wisnom, Virginia City, Nevada.



An anode comprising a metallic oxide and a support for the same formed of vegetable fibres. An anode comprising peroxid of lead in a granular form and a support for the same formed of vegetable fibre. An anode comprising a non-conducting envelop divided into a number of vertical pockets, a transverse pocket connecting them at the top and a metallic oxide inclosed in said pockets. An anode comprising a non-conducting envelop divided into a number of vertical pockets with a transverse pocket connecting them at the top, a metallic oxide inclosed in said pockets and a wire in said transverse pocket.

WATER-SUPPLYING ATTACHMENT FOR ROCK-DRILLING MACHINES.—No. 872,996; Henry Hellman and Lewis C. Bayles, Johannesburg, Transvaal.



In a rock-drilling machine or engine, in combination, a cylinder, a swivel mounted on the front end thereof, a drill steel slidably and non-rotatably positioned in the front end of the cylinder, and formed with a longitudinal port leading to the cutting end, ports placing the swivel in communication with said longitudinal hole and means for conducting water to the swivel.

The House of Braun.

Among the first of the newly constructed re-enforced concrete buildings to be occupied in the wholesale district in San Francisco is the five-story building at 576-584 Mission St., built for F. W. Braun, dealer in assayers' appliances and supplies, under the management of W. B. Roslington. The general offices, salesmen, and attractive counter displays are on the ground floor, while the other floors are given over to the storage of a large stock of apparatus, chemicals, and supplies. The parent house of F. W. Braun is at Los Angeles, temporarily situated at 409-415 East Third St. For their permanent quarters F. W. Braun has purchased a site on East Third St. with a frontage on the Santa Fe railroad tracks. Here Mr. Braun plans to erect a plant to accommodate his extensive business. The illustration shows the plan to be followed. The buildings, constructed of re-enforced concrete, will be ready within twelve months. A four-story and basement building will occupy the Third St. frontage. In the basement will be stored commodities requiring a uniform temperature and moisture. The main floor will be finished for general offices, purchasing and sales departments. The second floor will be the assembling room. The third and fourth floors will be used for the manufacture of instruments of precision for physical laboratories, chemical and scientific apparatus, and for a scientific glass-blowing department. Adjoining the main building in the rear will be a two-story warehouse, with a track frontage of about 150 ft. This building will be equipped with loading-platforms for shipment of goods by cars or wagons. A modern manufacturing building, fully equipped to manufacture this company's line of laboratory machinery and apparatus, will be built in the rear of the warehouse. The plant will include an iron and brass foundry, and a sheet-metal and wood-working department. Another interesting feature of the plant will be the installation of a series of fire-proof chambers, with steel storage-tanks, for commercial liquid acids and industrial alcohols and ammonia, making it feasible to bring these commodities from the place of production in tank-cars, and transfer on arrival by pressure-pipe service, directly into the storage-tanks, reducing the cost of handling to a minimum. Mr. Braun is the owner of valuable patent rights, covering useful and popular appliances used in chemical and metallurgical laboratory work and he has developed a world-wide demand for his manufactures.

Catalogues Received.

THE BLAISDELL Co., of Los Angeles, Cal., has issued 'Catalog H, El Oro Tube-Mill Lining,' giving some useful information in regard to tube-mill linings.

THE KILGORE-PETELER Co., of Minneapolis, Minn., has sent us 'Catalogue No. 5; Peteler Industrial and Mine Cars, Narrow-Gauge Railways.' This describes the ore cars, car wheels, and buckets for earthwork excavations, manufactured by this company.

THE PENNSYLVANIA SALT MFG. Co., of Philadelphia, Pa., has issued a catalogue entitled 'The Wedge Furnace for the Mechanical Roasting of Ores.' This furnace is designed for mechanically roasting pyrite fines and sulphide ores, including blende.

THE SULLIVAN MACHINERY Co., of Chicago, has published a catalogue entitled 'The Excavation of Rock by Machinery;' this describes the air-drills, channeling machines, air hammer-drills, and also less fully the air-com-

pressors manufactured by that company. The instructions to drill-runners are well worth reading by all users of rock-drills.

THE UNION IRON WORKS Co. has sent us two catalogues, 'The Merton Roasting Furnace' and 'Low Sample Crusher and Sample Grinder.' In the first is described the Merton furnace, which has been used at many mills in Australia. While it is new to this country, it has been used for some time there. The Low Sample Crusher and the Low Sample Grinder are especially designed for such work as crushing samples taken while examining a mine; both can be run by hand.

A New Mine-Car.

An order was placed recently with the Arthur Koppel Co., manufacturers of industrial railway materials, for 200 mine-cars by the New River Pocahontas Con. Coal Co. The first sample car of the order was ready for inspection on



November 15, and a committee consisting of several mine superintendents of the vicinity went to Koppel to inspect the car. The committee examined the car in detail and then announced that it was the best they had ever seen. An additional order for 200 cars was immediately placed with the Koppel Company.

This car is of all-steel construction. It is a very low car with large capacity, the over-all height from top of rail being only 30 in. and the capacity 57½ cu. ft. The gauge is 44 in. A special feature in the design is the round buffer, built of special steel channel having small depth and very wide flanges. At the ends the buffer channel is bent semi-circularly and projects beyond the car, to give clearance between the corners of the cars on curves. Between the ends the buffer channel is continued clear through the car, making a continuous buffing column capable of carrying all end-shocks from car to car, without transmitting the whole strain to any particular car. This feature is similar to that used on standard railroads.

The side over-hang has been well stiffened and gives the car its large capacity. The large radial corners of the car-body facilitate the discharge of the load. The door at one end is of the lift type, and is well stiffened to give the necessary rigidity. The wheels are 16 in. diam. with axles and bearings of a special patented self-oiling type.

These cars are for general coal-mine service, transporting the coal from the workings to the tipples, where they are automatically dumped. A special device has been fastened to the bottom of the car to catch the dogs on the chain-hoist used at the tippie-incline. This car is light, rigid, and serviceable; considering its low over-all height and high capacity, together with its substantial buffers, it is considered most suitable for use in mines where a narrow-gauge railway can be operated.

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